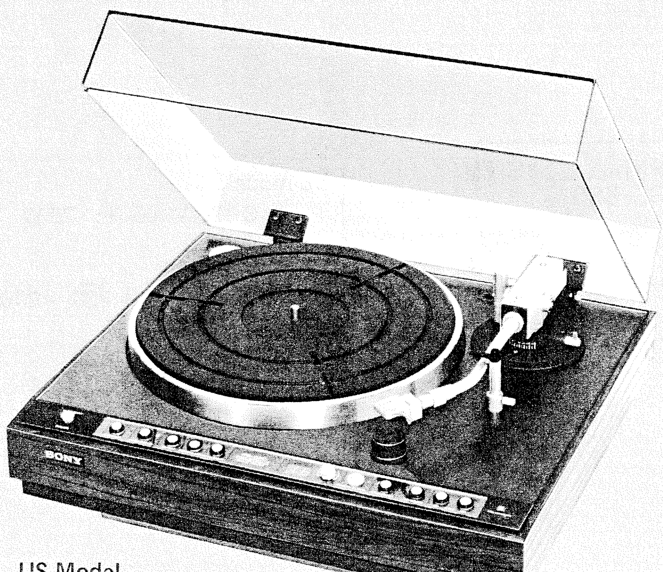
PS-B80

US Model
AEP Model
UK Model



US Model

STEREO TURNTABLE SYSTEM

SPECIFICATIONS

GENERAL

Power Requirements:	220, 240 V ac ~ adjustable, 50/60 Hz (UK model) 120, 220 V ac ~ adjustable, 50/60 Hz (AEP model) 120 V ac, 60 Hz (US model)
Power Consumption:	28 W (US model) 29 W (UK, AEP model)
Dimensions:	Approx. 500 (w) x 175 (h) x 430 (d) mm $19\frac{3}{4}$ (w) x 7 (h) x 17 (d) inches including projecting parts and controls
Weight:	Approx. 15 kg, 33 lb 2oz. (net) Approx. 18.5 kg, 40 lb 13 oz. (in shipping carton)

TURNTABLE

Platter:	32 cm ($12\frac{5}{8}$ in.), aluminum-alloy diecast
Motor:	DC servo-controlled linear BSL motor
Drive System:	Direct drive, crystal lock control system
Speed:	$33\frac{1}{3}$ rpm, 45 rpm
Starting Characteristics:	Comes to nominal speed within a ¼ revolution ($33\frac{1}{3}$ rpm)
Wow and Flutter:	±0.04% (DIN) 0.02% (WRMS)
Signal-to-Noise Ratio:	78 dB (DIN-B)
Speed Deviation:	Within ± 0.002 %
Load Characteristics:	0% up to 230 g tracking force
Automatic System:	Lead-in, return, reject, repeat, record-size selection, zero balance, anti-scating

TONEARM

Type:	All-electric tonearm, universal
Pivot-to-Stylus Length:	235 mm (9¼ inches)
Overall Arm Length:	325 mm ($12\frac{3}{4}$ inches)
Overhang:	14 mm ($\frac{9}{16}$ inches)
Tracking Error:	+2° 27′, −1° 30′
Stylus Force Adjustment Range:	0.5–3.0 g
Shell Weight:	11 g
Cartridge Weight Range: (including shell)	12–21 g 21–30 g (with extra weight)

SAFETY-RELATED COMPONENT WARNING!!

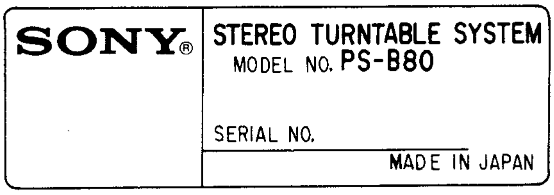
COMPONENTS IDENTIFIED BY SHADING AND MARK ⚠ ON THE SCHEMATIC DIAGRAMS, EXPLODED VIEWS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

SONY®

SERVICE MANUAL

MODEL IDENTIFICATION

– Specification Label –



SONY®

STEREO TURNTABLE SYSTEM
MODEL NO. PS-B80

SERIAL NO.

MADE IN JAPAN

US model:
AC 120 V 60 Hz 28 W

UK, AEP model:
AC 110 – 120, 220 – 240 V ~ 50/60 Hz 29 W

SECTION 1
OUTLINE

1-1. Handling Precautions for MOS ICs (ICs 307 – 314, 411, 414 – 421)

Generally, the insulation resistance of the oxide layer in MOS IC structures is very high, and the oxide layer is very thin. Because of this, it is possible that the static voltages usually present on clothes and the human body will be enough to generate a potential difference across the insulator, high enough to cause a breakdown of the insulating layer.

The following precautions should be taken while handling these ICs.

(Particular care should be taken under conditions of low humidity.)

Precautions in Replacing MOS ICs

1. Store new ICs by inserting them into a urethane-polyester cushion (which is somewhat conductive), or wrapping it in aluminum foil, so that all the pins are at the same potential.
   (The ICs should be stored in that manner until mounted on the circuit board.)

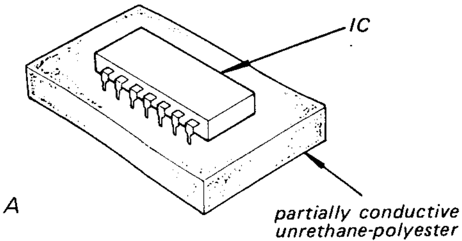

IC
partially conductive unrethane-polyester cushion

Fig. A

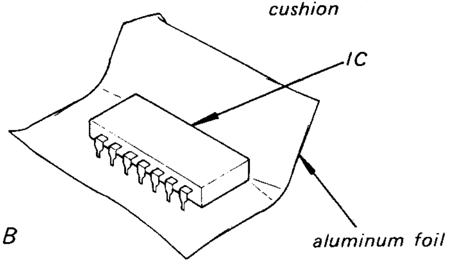

IC
aluminum foil

Fig. B

2. Check the soldering iron for possible power-line leakage current. Make sure that there is no leakage path by connecting an ohmmeter to the tip of the soldering iron and the plug as shown in Fig. C. If there is a leakage path, use some other soldering iron.

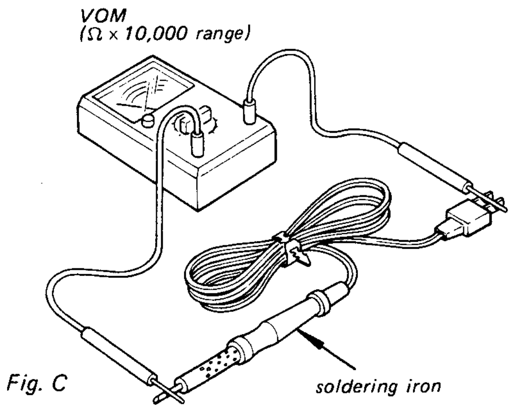
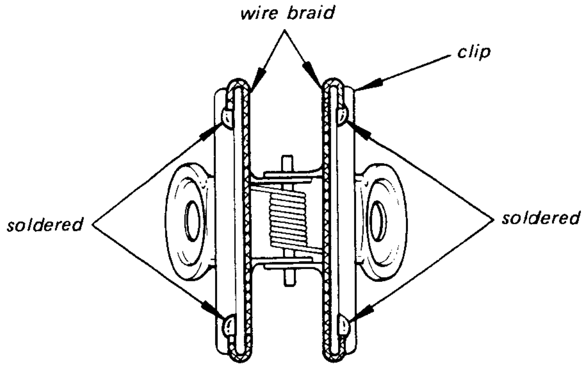

VOM
(Ω x 10,000 range)
soldering iron

Fig. C

3. Equalize any potential difference between the clothes, the tools in use, the work bench, the set being worked on, and the packaged IC by touching them all in succession with the hands or a conductive wire or tool.
4. The following are effective methods for handling ICs that remove the potential difference across the oxide layer.
   - Use a paper clip modified by soldering in a wire braid insert.


wire braid
clip
soldered
soldered

Make sure that there is no solder on the inside.

Fig. D

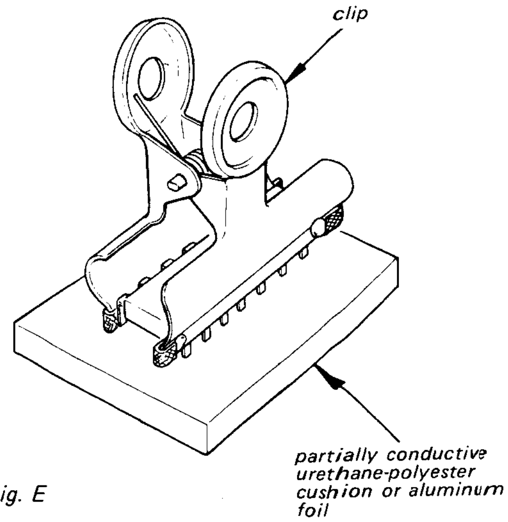
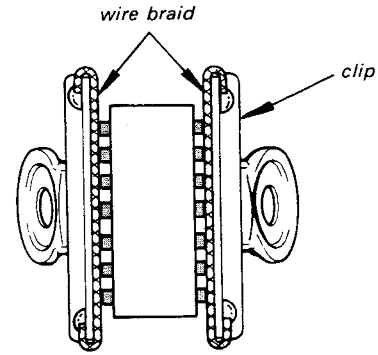

clip
partially conductive urethane-polyester cushion or aluminum foil

Fig. E


wire braid
clip

Make sure that all the pins are in contact with the wire braid (all the pins will then be at the same potential.).

Fig. F

- Take a short length of fine bare wire and wind it around the IC so that it shorts all the pins of the IC, while it is still in the urethane-polyester cushion or aluminum foil. This ensures that all the pins are at the same potential.

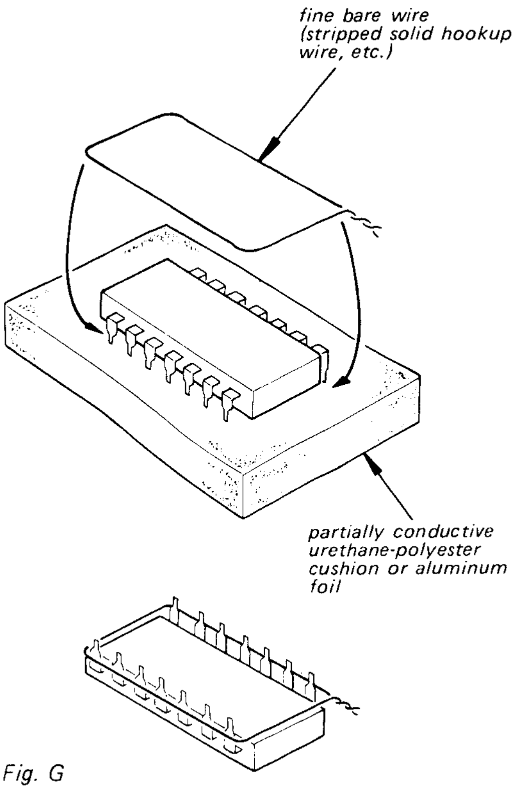

fine bare wire
(stripped solid hookup wire, etc.)
partially conductive urethane-polyester cushion or aluminum foil

Fig. G

- When it is necessary to handle the IC with the fingers, do not touch any pin, and hold the IC at the ends of its plastic-package case as shown in Fig. H.

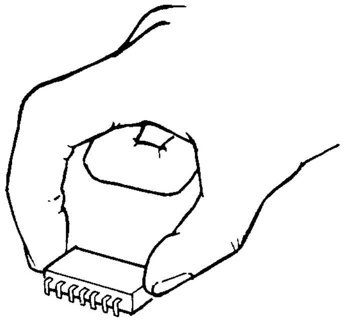


Fig. H

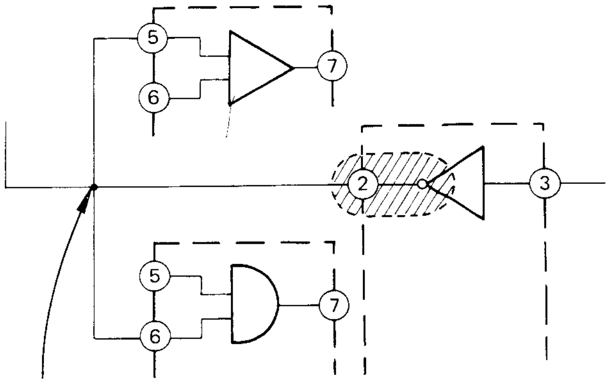
5. Method of Mounting
Insert the IC while holding it with the modified clip, and solder all the pins with the clip still shorting the pins. (Similarly, solder all the pins while the bare shorting wire is still wound around them.). Remove the clip or the bare shorting wire only after all the pins have been soldered.

Precaution while Checking C-MOS ICs

The C-MOS ICs (Complementary MOS) are MOS ICs that have their output sections made up of N-channel and P-channel push-pull stages to increase their speed of operation. If the output terminal of these ICs comes into contact with B+ or B- voltage, then the FET which is ON at that time will either become shorted or open.

This is valid for all the output sections that are connected together by the interconnections. Even the circuits that are physically separated (and not on the same board) can be destroyed simultaneously.

Example:



If this line is grounded, or touches B+ or B- bus . . . , the output stage of this IC will be destroyed.

Fig. I

1-2. ELECTRONICALLY-CONTROLLED TONEARM "BIOTRACER"

1-2-1. Resonance Damping at Low Frequencies by Speed Feedback:

Tonearm vibration, particularly the resonance generated at low frequencies, is automatically reduced by feeding the speed fractuation to the linear motor which monitors the speed of the tonearm.

1-2-2. Front-panel-controlled Auto Zero Balance and Stylus Force:

Zero balance is set automatically merely by fitting the cartridge and placing the tonearm on the tonearm rest. To set the stylus force, turn the knob on the front panel, and the built-in microcomputer will measure the force and display the results on the digital display. Changing of the stylus force while listening to the tones is also possible.

1-2-3. Automatic Anti-skating:

Using a non-contacting Angle-Detector System which reads off the angle of rotation of the tonearm by optical means, the correct value of rotational angle necessary to prevent skating can be estimated, knowing the position of the tonearm, and the anti-skating adjustment is carried out automatically.

1-2-4. Remote Full-Auto Function:

A luminar sensor controls the tonearm's lead-in and return, while monitoring of the down and returning positions is carried out by the linear motor. Accordingly, the operation is accurate and virtually silent.

1-2-5. Tonearm Lifter Control from Front Panel:

The up/down operation of the tonearm lifter is controlled by the vertical linear motor, and the damper, fitted with a speed feedback circuit, operates smoothly free from the effects of temperature change and aging. A muting circuit operates when the tonearm is in its top position and because this function is cancelled when the tonearm is down on the turntable, the bother of having to lower the amplifier volume every time the stylus has landed on the record is eliminated.

1-2-6. Fast Repeat Facility, Memory Repeat:

Repeat operation, controlled electronically by the horizontal linear motor, begins as soon as the tonearm returns to near the edge of a record. Further, if certain sections are required to be repeated, this can be done by pre-setting the memory with the MEMORY LEAD IN and the REPEAT buttons.

1-2-7. Manual Operation with the Dust Cover in Place:

Manual operation is throughly possible without touching the tonearm, since the upward/downward and rightward/leftward movement of the tonearm can be done by buttons provided on the control panel.

1-2-8. Electronically-controlled Tonearm

This machine uses the electronically-controlled tonearm BIOTRACER. This tonearm contains a set of two linear motors, one for vertical drive and one for horizontal drive.

Examples of linear motors are already known in the form of such as dynamic speakers, pen recorders etc.

The linear motors consist of a coil placed in an electromagnetic field which is uniformly distributed. The coil is made to move back and forth along specific axis according to the strength of the current in the coil and the polarity. When the two linear motors are placed on different axes, the two units in operation make a multitude of functions possible when they work in combination.

From its special character, the linear-motor-driven tonearm has been given the name BIOTRACER.

1) BIOTRACER Structure

Usually, the tonearm has two turning pivots, one for horizontal and one for vertical. BIOTRACER has two linear-motor configurations, independent of each other, in the places of the two pivots as shown in Fig. 1. The operation of these two linear motors differs in that one operates in a vertical plane and the other in a horizontal plane, but their operational principles are exactly the same. They operate according to the principle embodied in Fleming's left-hand rule whereby, as in Fig. 2, when the current flows in the coil within the electromagnetic field. The force is produced at right angles to the direction of the magnetic flux and the current flow. Accordingly, the tonearm can be maneouvered freely by controlling the current flow.

In order to send instruction signals to the unidirectional linear motors, first the operation of the tonearm must be checked. So, a speed sensor as shown in Fig. 3 has been attached separately both to the above of the horizontal rotating axis corresponding to the fixed side of the horizontal linear motor, and to the top of the tonearm corresponding to the fixed side of the vertical linear motor.

A big feature of the above-mentioned tonearm is that separate driving device is installed on the two pivots, and if so arranged, the system can be controlled by the instructions from the control circuits. Also the tonearm can be connected directly to the servo circuit as well as the turntable motor.

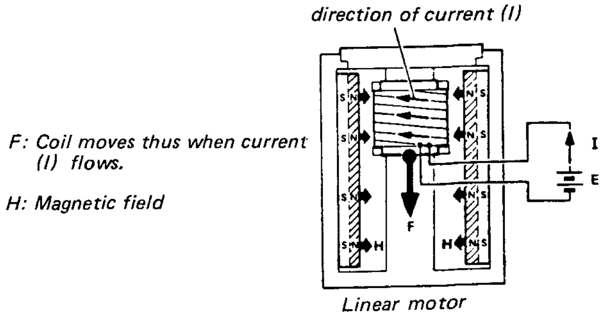

direction of current (I)
F: Coil moves thus when current (I) flows.
H: Magnetic field
S N
N S
I
E
F
H
Linear motor

Fig. 2

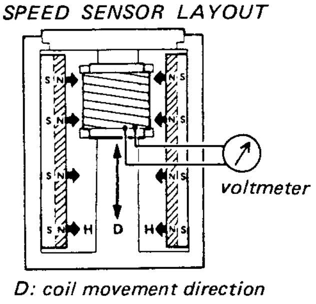

SPEED SENSOR LAYOUT
S N
N S
H
D
voltmeter
D: coil movement direction

Fig. 3

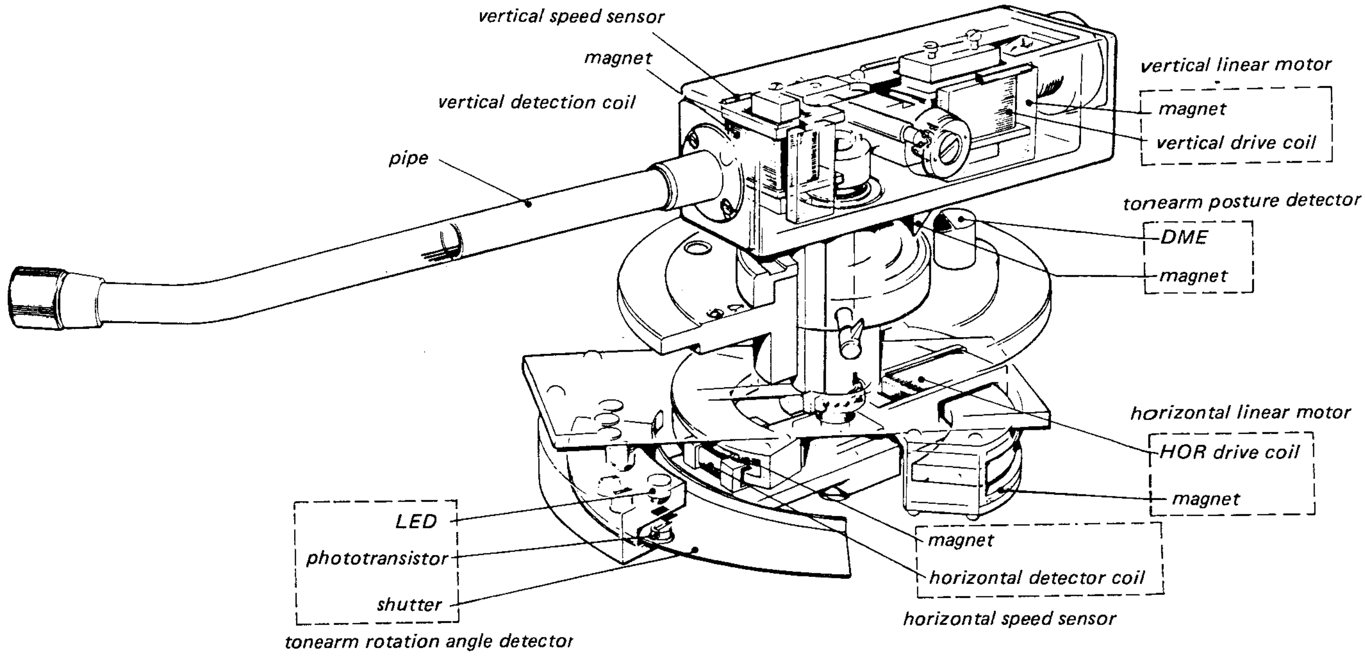

vertical speed sensor
magnet
vertical detection coil
pipe
vertical linear motor
magnet
vertical drive coil
tonearm posture detector
DME
magnet
horizontal linear motor
HOR drive coil
magnet
LED
phototransistor
shutter
tonearm rotation angle detector
magnet
horizontal detector coil
horizontal speed sensor

Fig. 1

2) Polarity of the Linear Motors and the Sensors

The linear motors and the sensors have polarities. Looked at from the outside, the direction of movement is thought to be decided when a voltage of a certain polarity is applied. Polarity includes all the following factors:

Direction of electromagnetic field.
Direction of coil winding.
Wire connections.

If all of them are in reversed polarity, the directions of the motors and sensors are also reversed. Among them, the direction of the coil winding does not change so, when carrying out repairs, maintain the necessary polarity in accordance with Fig. 4 and the mounting diagram.

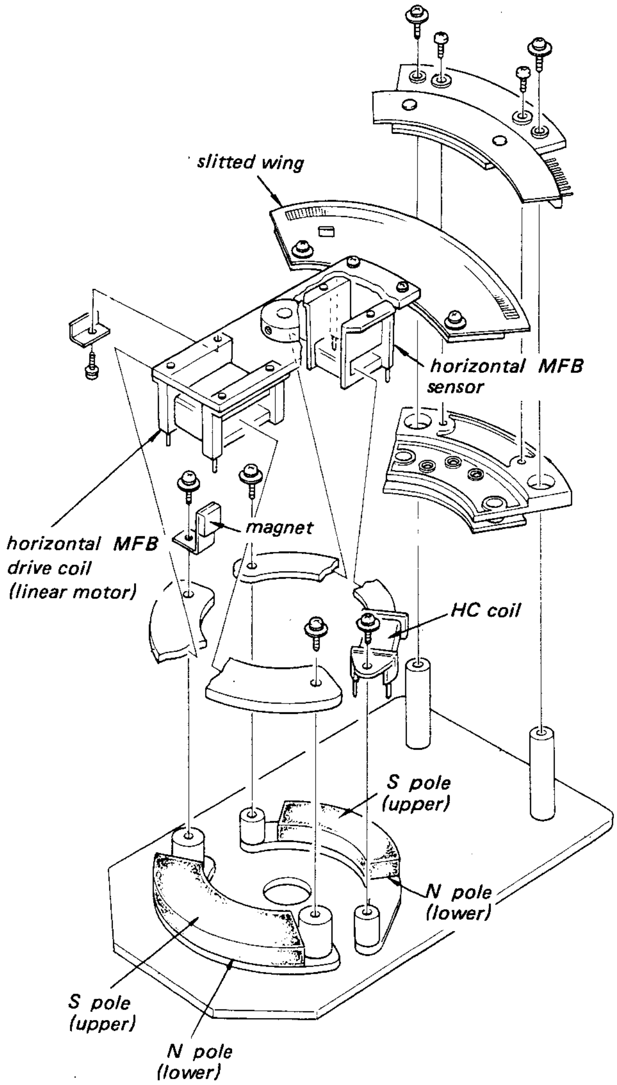

slitted wing
horizontal MFB sensor
magnet
horizontal MFB drive coil (linear motor)
HC coil
S pole (upper)
N pole (lower)
S pole (upper)
N pole (lower)

Fig. 4

3) Vertical Linear Motor

At the rear end of the tonearm is a linear motor (vertical) to move the tonearm up and down. The polarity of the magnet here is N at the outside, and S at the inside. The cover of this linear motor acts as a yoke. Fig. 5 shows the end of the tonearm with the cover removed.

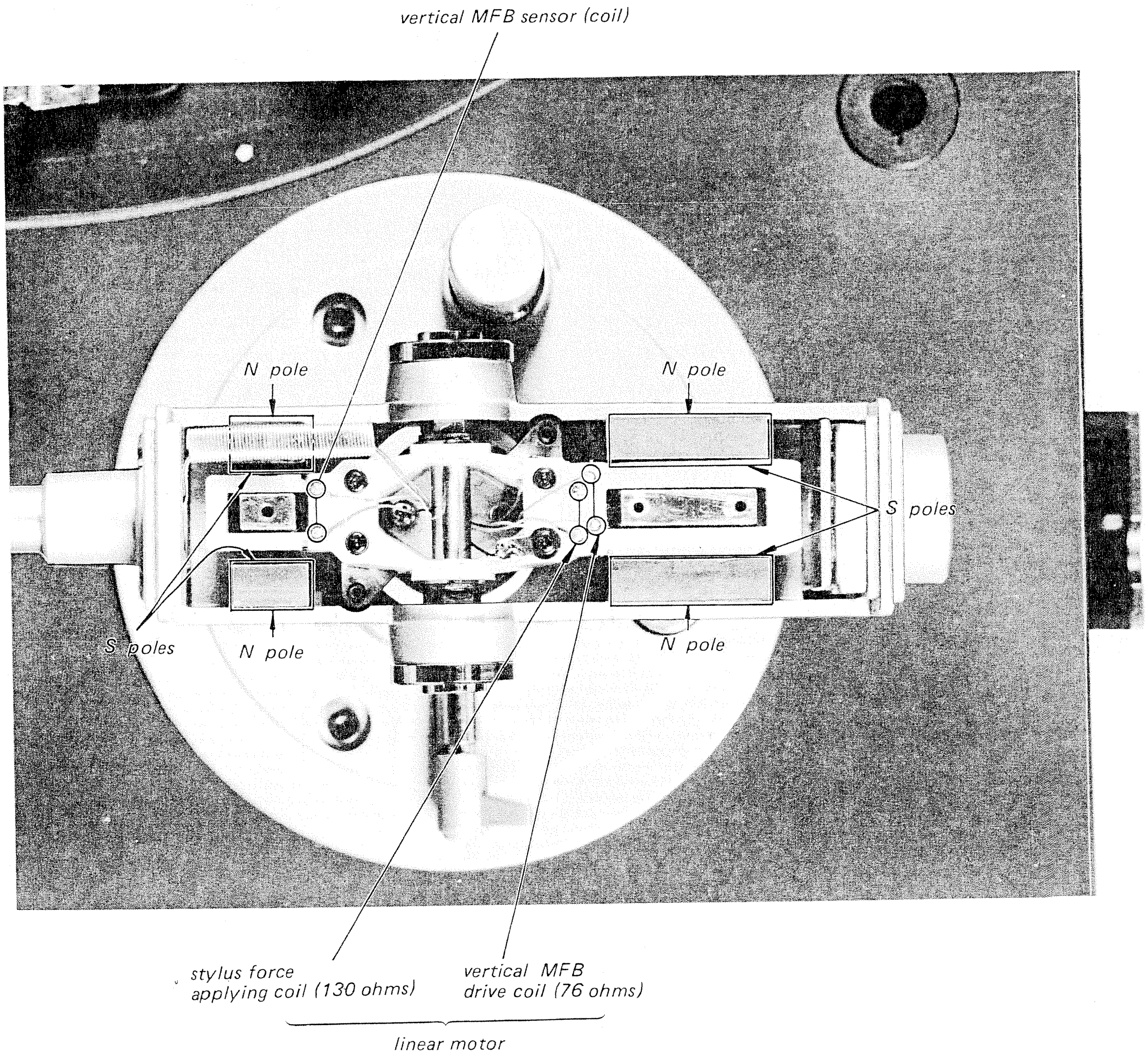

vertical MFB sensor (coil)
N pole
N pole
S poles
S poles
N pole
N pole
stylus force applying coil (130 ohms)
vertical MFB drive coil (76 ohms)
linear motor

Fig. 5

4) Linear Motor and Its Circuit

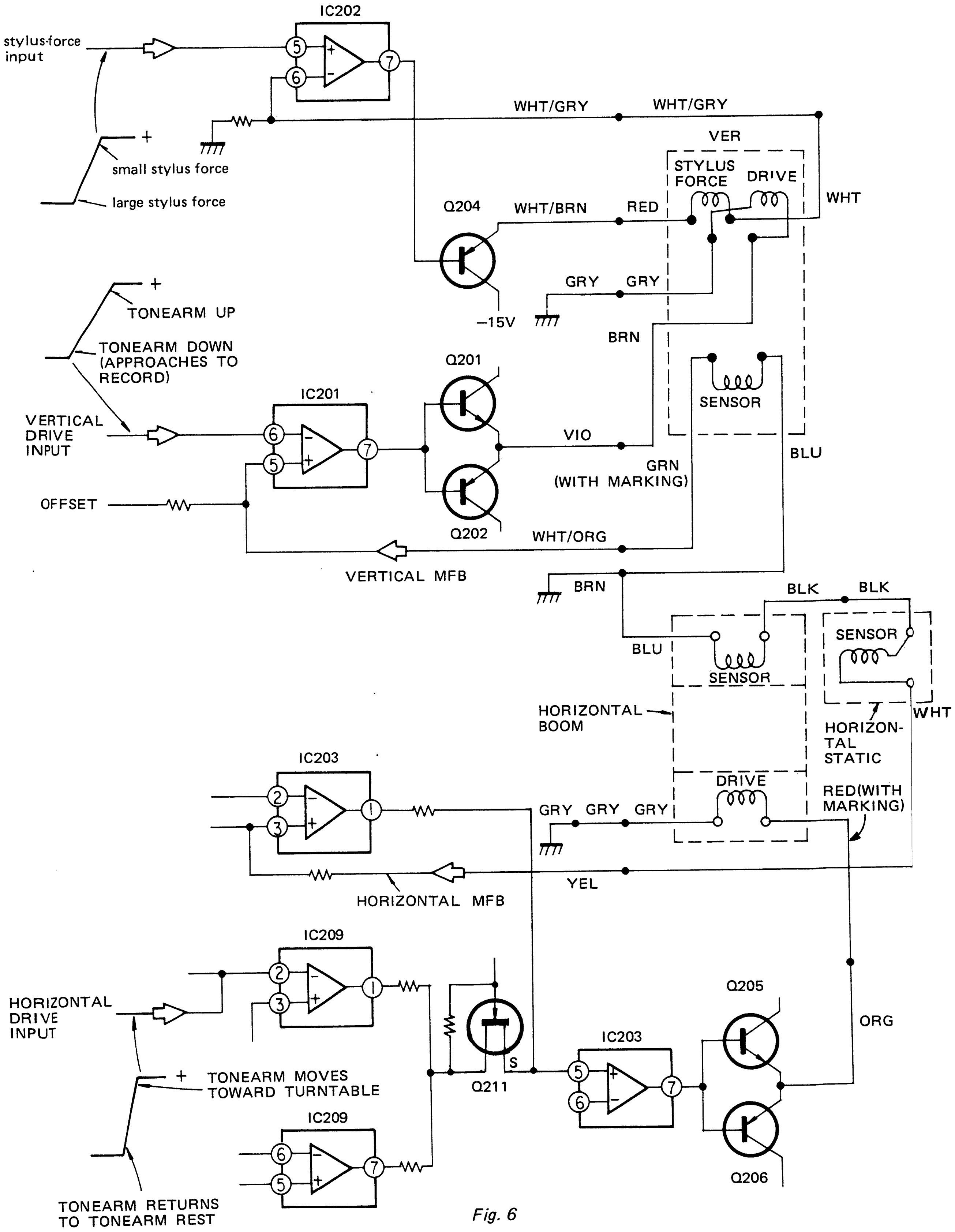

IC202
stylus-force input
+
small stylus force
large stylus force
WHT/GRY
WHT/GRY
VER
STYLUS FORCE
DRIVE
WHT
Q204
WHT/BRN
RED
GRY
GRY
−15V
+
TONEARM UP
TONEARM DOWN (APPROACHES TO RECORD)
VERTICAL DRIVE INPUT
BRN
Q201
IC201
SENSOR
VIO
OFFSET
GRN (WITH MARKING)
BLU
Q202
WHT/ORG
VERTICAL MFB
BRN
BLK
BLK
BLU
SENSOR
SENSOR
WHT
HORIZONTAL BOOM
HORIZONTAL STATIC
IC203
DRIVE
GRY
GRY
GRY
RED(WITH MARKING)
YEL
HORIZONTAL MFB
IC209
Q205
ORG
HORIZONTAL DRIVE INPUT
IC203
S
+
TONEARM MOVES TOWARD TURNTABLE
Q211
IC209
Q206
TONEARM RETURNS TO TONEARM REST

Fig. 6

1-3. TURNTABLE AND OTHERS

1-3-1. Automatic Record-size Detection Facility:

The size of records is monitored and measured by using a photo-electric device and a built-in microcomputer which then automatically puts the tonearm into operation.

1-3-2. Crystal-locked Magnedisc Servo System:

The turntable driving system employs the established magnedisc system known as a highly-accurate rotation monitoring and, a phase-locking using a precision output frequency generated by a crystal oscillator to obtain a constant turntable rotation with low drift.

1-3-3. Linear BSL Motor:

A smooth and silent rotation is obtained from the Linear BSL Motor – almost no cogging which can become a source of wow and flutter or S/N degradation. Having a high torqueage, the starting response is excellent at a quarter of a turn.

1-3-4. Turntable Incorporates Electromagnetic Brake:

Playing of records is easy due to the tonearm's independent operation and the simple start/stop operation of the turntable rotation, and a lead-in to a music is done very easily. Also, with the electromagnetic brake, stopping the turntable is smooth and quick as well as simple to use.

1-3-5. Stylus Cleaner:

Perfect sound can always be enjoyed since the stylus can be cleaned automatically at the mere press of the CLEANER button.

1-4. ABOUT THE CPU (MB8841)

The MB8841 is a four bit, one-chip microcomputer. One chip means that a combination of all the necessary parts that make up a microcomputer are built into one IC. It contains:

- ROM (Read Only Memory) for programming.
- Calculation Part (for data movement and data alteration)
- RAM (Ramdom Access Memory) for temporary data storage.
- I/O (Inputs and Outputs)
- IRQ (External Break Input)

and so forth. Here we have named it CPU (Central Processing Unit) in the sense of its having central control.

1-4-1. Clock Oscillation:

Operation time of the CPU is based on twelve clock, divided into the reception time for receiving a given instruction (fetch) and the execution, six for reception and six for execution. The clock signal is made by a crystal oscillator XT401 connected between terminals 1 and 2 of the CPU (IC414). In this set, the oscillator's frequency is approximately 3.92MHz.

The CPU operates on a double-access system whereby the second instruction signals are received in the six clock periods during which the first instruction signal is executed. Looked at from the outside, one program process is digested in six clock steps.

If the clock oscillator's frequency is 3.92MHz, then the time taken for one command is:

$$3.92\text{MHz}/12 = 38.6\mu\text{sec}.$$

The execution is performed in every six clock at 3.92MHz/6 = 657,000 steps/sec.

The input side for the clock oscillator is terminal 1.

1-4-2. I/O PORT:

In the sense that it is a port or harbor for the inputs and outputs, the I/O PORT is similar to the role a heliport plays for the helicopters.
The I/O Port consists of:

- Output-Only Ports . . . . P, O_H, O_L.
- Combined Input/Output Ports . . . . R_0, R_1, R_2, R_3.
- Input-Only Ports . . . . . K, $\overline{IRQ}$

The ports apart from the $\overline{IRQ}$ are to be handled as the binary code (parallel input/output word) of 16 variants (0-F) composed of four bits of 0 and 1 each.

The Combined Input/Output Ports are a group which can be used either as inputs or outputs. If the input is connected, it can be used as "I" PORT, and if a load is connected, it is used as "O" PORT.

1-4-3. Weighting of Port Words

At one port, four bits are put into the input in succession and handled as one word unit at the output. A word is handled as 0-15 (F), the number which can be expressed with four bits.

The following weights are assigned to all the words:

P, O_H, O_L, R_0-R_3, K etc:		WEIGHT
15 11 7 3	MSB (most important weight)	8
14 10 6 2	2SB	4
13 9 5 1	3SB	2
12 8 4 0	LSB (lightest weight)	1

These are expressed in the text in the following way:

PORT P = E
"E" is put out at PORT P
PORT P = 1110
1110 is put out at PORT P
all used

"E" stands for "14" since 14 = 8+4+2 .... thus, 1110 is put in and out. Moreover, when X is included as in 111X, the X part is unfixed, that is, an initial status.

1-4-4. Port Wordweight and Meanings

The set is divided into the section utilizing the existence of wordweight (wordweight usage), and the section which uses information in BITS (bit usage) which have nothing whatever to do with weighting.

Example 1: PORT R_0 = XX0X

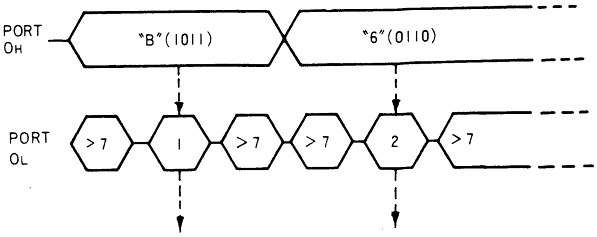
R_1 = 0 ... R_3, R_2, and R_0 are all X

R_1 = 0 turns the REPEAT lamp on and this is not affected by the conditions of R_3, R_2 and R_0.

This way of using the set is known as "bit usage".

Example 2: PORT O_H = B
Then PORT O_L = 1111 → 0001 → 1111
Then PORT O_H = 6
Then PORT O_L = 1111 → 0010 → 1111

The PORT O operates according to the following timing, because this is an output with latch.



FIRST, 1011 IS READ IN IC416.
SECOND, 0110 IS READ IN IC417.

Fig. 7

Due to IC416 and 417 are composing a D/A converter of a total of 8 bits, the outputs of the upper IC416 and lower 417 changes into 1011 and 0110 respectively. This means that the next analog output is extracted.

1011: 16 x B (11) = 176

0110: 6 + 176 = 182

Because the total of 8 bits can be expressed from 0000 0000 to 1111 1111, or 2^8 = 256 variants, this status handles a 4-bit word two times as a big word and its output is 182/256.

This way of using the set is known as "word usage".

1-4-5. Bit and Word in the CPU

In the CPU as noted above, the separate handling of bit and word differs from the software in the following manner:

To explain the previous example 1. in terms of 1101:

Internal Operation of CPU	PORT R_{ϕ}	Terminal	Outside of CPU
Previous status:			
PORT R_{ϕ} = 1111		$R_3 = 1$	
Instruction 1:			
R BIT$1		$R_2 = 1$	
Execution:			
XXOX = 1101 (word F changes to D and moves)	F → D	$R_1 = 0$ ...	REPEAT lamp lights up
Instruction 2:			
OUT PORT R_{ϕ}		$R_{\phi} = 1$	
Execution:			
R_{ϕ} = 1101 (word F changes to D and moves).			

Note: R BIT$1 is for resetting the first bit within the series φ, 1, 2, 3.

← Inside the CPU, words are used →

← In the software (outside of CPU), bits are used →

This is a program for bit usage.
In other words, PORT R_{ϕ} = D.

1-4-6. Explanation of Each Port

1) Port P

This is an output-only port and all the bits are normally reset to "1". The outputs have a latching function and are maintained as they are until they change when once they have been indicated.

The port P is the power source for the function key. The key (function button) which is connected to the bit "φ" of this port applies an effective input to the port K.

2) Port K

This is an input-only port. Just before the CPU reads the inputs, all bits are set to "1" and this port finds out whether the "φ" of port P is comming in as a parallel-word input by pressing a function button.

3) Port O_H

The output-only port. By combining with the port O_L, the output for one word from this port is divided into 16 variants (six in this machine). Normally all the outputs are reset to "1", output is maintained by the latch until the status is changed.

The port O_H operates under the word usage (D/A) or the bit usage (all others). Used as the data port of the port O in conjunction with the port O_L.

4) Port O_L

An output-only port. The output in conjunction with the port O_H, indicates the locations the data of the port O_H should go and it is normally reset to "1" and with latch signal

5) Ports R_ϕ and R_1

A combined input/output port. However, in this machine this is used as an output port. The outputs are also with latch.

6) Port R_2

An input/output port. Used as an input port in this machine. All the input terminals are set to "1" just before the CPU checks the inputs, then all the inputs are checked if they are "0" or "1". The output is maintained by an external circuit till the CPU reads off, due to there being no latch for the input while the output being set is latched.

7) Port R_3

A combined input/output port. Normally, all the bits are reset to "1". R_{12} is a latched output for muting. The rests R_{13}, R_{14} and R_{15} are for inputs.

8) $\overline{\text{RESET}}$ Input:

When $\overline{\text{RESET}}$=0, the CPU is reset, and the terminals other than the special $\overline{\text{IRQ}}$ are all reset at "1". $\overline{\text{IRQ}}$ is reset to "1" when the POWER is switched on.

9) $\overline{\text{IRQ}}$ Input:

External break input port. When reading the $\overline{\text{IRQ}}$ during internal execution of the program (ready: $\overline{\text{IRQ}}$ enable), the status of the break input together with the progress of the program is estimated according to whether the CPU will permit this external break and whether there is any break input or not. The corresponding output is corrected.
Ex: $\overline{\text{IRQ}}$ inhibitted until the horizontal position of the tonearm comes to the tonearm rest.

When the tonearm has come to the tonearm rest, the $\overline{\text{IRQ}}$ is permitted, and according to whether the $\overline{\text{IRQ}}$ is "1" or "ϕ", the CPU finds the inclining angle of the tonearm (UP/DOWN), and sets the tonearm's zero balance.

1-5. BEFORE ATTEMPTING THE REPAIR

All the programmed operations of this machine are handled by a four-bit microcomputer IC's memory. The Microcomputer chips are called as CPU (Central Processing Unit) and the IC in this set is IC414, MB8841-125.

Roughly 2000 program steps are included in this CPU. One step of this takes roughly 33.5 microsecs. to carry out. Thus in one second, five million nine hundred and sixty thousand steps are processed. If each step of a program were to be run through in successive steps, 2000 steps are processed in 3.35msecs, then in one second, the programs are handled 298 times.

However, the actual processing happens even faster because unnecessary programs are skipped along with the changes in set status.

If this micro changes are disregarded, the computerized set can be thought of in the following manner:

The inputs and outputs of a computerized set are normally connected. When repairing the set, do not think of this CPU as a industrial big computer, but merely as a jumper IC to which a little less than 20 leads for inputs and outputs are connected. In other words, it should be possible to repair the set either merely by checking the group of "inputs → leads labelled CPU → outputs" with a VOM or an oscilloscope.

1-5-1.On the Major Program

The major (macro) program is the complete set of operations. This is exactly the same set of operations to which those using manually-operated record players are accustomed. These are:

1) Remove the tonearm from the tonearm rest and set the zero balance.
2) Decide the stylus force.
3) Place a record on the turntable.
4) Start the motor.
5) Lead in the stylus by placing the tonearm lifter down on the lead-in groove.
6) When the music has finished, lift the tonearm and return it to the tonearm rest.
7) Switch off the motor.
8) When wishing to repeat the music, carry the tonearm to that portion of the record by hand.

A special feature of manual operation lies in the free order in which only the necessary operations may be carried out, and lies in the fact that one can freely carry out these operations, when a record has finished, without having to reset the zero balance to switch the motor on first and suchlike.

However, a computer cannot think things like this. For example, if we select a program where zero balance is unnecessary for the second record, if the cartridge is changed between the two records, the computer will not be able to set the zero balance for the second record. The reason why this difference exists is that humans are able to make decisions based on pattern recognition whereas computers carry out operations based on the programs and feed them to the program output terminals. In other words, the computers do not know anything of the software at the extension of the output terminals.

So, programs are all made in the correct order. However, humans can check immediately whether or not some error has been made – for example, when picking up a screwdriver, it is possible to check whether the hand has not adopted the necessary posture for the task.

From the above, it can be seen that macro operation consists of the two types:

1) When faults occur in the software in the unidirectional output routes, malfunction is restricted to that area alone.
   For example, if there is a motor malfunction or something, the CPU will not know that the cleaner is faulty even if the motor-start instruction signal is put out, the CLEAR button is pressed and the tonearm is lowered.
2) If faults occur in the software where the output routes have feedback, the operation will cease immediately one step before the step where the fault has occurred. Or else it will stand by at the initial point of that routine. Repairs are most difficult in the later case.

Note: Ceasing operation here means that the CPU will be on Dynamic Standby, while retaining its program.

1-5-2. Repair of the Computerized Set

The following repairing methods are a general classification.

1) This method is to find out at what point the program has gone wrong by applying a diagnosis based on the situation to that judging point. Then proceed to the next step.
2) This method is to judge whether an operation is good or wrong by injecting a specific interfering signal even with which a program is processed normally.
3) This method is to check all the points (several hundred) simultaneously to which test probes are connected to see whether the programs are being processed in the CPU normally.
4) This method involves checking by returning to the initial status from a specified step of the program.
5) This method is to disconnect the CPU and to check the set by using a manual control.

1-6. REPARING

Repair the set according to the following methods (techniques):

Tools: Medium-wave radio (small) and earphone.

This machine's microcomputer works on the 3.92MHz clock mentioned above. However, because the speed of execution is roughly 3.92/6=650kHz in the CPU and its environs compound pulses are generated dynamically centered around 650kHz.

First, remove the bottom plate of this machine and place the radio near the CPU. When the machine's power is switched on, the operating CPU is radiating compound AM, FM, PWM frequencies. It is not necessary to set the radio exactly on 650kHz, as any frequency which can be received will do.

Note: Take care not to cause shorts by the metal parts of the radio cabinet.

1-6-1. Procedure for Locating Faults:

1) Now, the sound received as noise indicates that the program is being executed.
2) If the incoming sound has a tone in it (a piii-pi, piii-pi sound for example), the program is being executed in the cycle of that tone.
3) Press the function button:
   Even if the tone changes for an instant (including if it returns to the original tone afterwards), it means that the input circuit between that button and the CPU is normal.
   If there is no change in the tone at all, it means the input circuit is faulty.
   If the set should be operating but the incoming sound from the CPU is changing, then the output circuit is faulty.
4) The received tone should change as the process changes from one step (ex, zero balancing) to another (ex, when zero balancing is completed, the next input search). So, while the tonearm returns to the tonearm rest the received sound will something like zazza. . then the zero balance is set at a sound something like bibbii. Having finished, the set is now ready for the next step. (suuun sound).
   Thus, repairs to the microcomputer-equipped sets can be easily carried out by listening to these differences in sound of the incoming signal to a radio. It is equivalent to connecting remote probes to all of several-hundred necessary junctions and checking the composite frequency spectrum.

5) Examples of faults likely to occur:
- The sound does not change even when the tonearm is returned to the tonearm rest:
  No rest signal ..... Around the tonearm rest detection circuit IC407 damaged up as far as the CPU.
- No change in sound when CLEANER button is pressed:
  Button (input) circuit faulty
- The sound changes when CLEANER button is pressed, but the brush motor does not rotate (trouble lies in the motor).
  CPU is operating so the motor circuit at its output must be faulty.

1-6-2. Note on Undertaking This Repairing Method:

Make sure to use the earphone. Although sets are generally sealed, staic may interfere when the covers are removed for repairs, so use the earphone to avoid unnecessary interference.

1-6-3. Positioning of the Set when Repairing

On most players, checks on such as the printed circuit boards can be carried out by tipping the set over as far as it will go without the turntable falling off.

However, this machine is controlled at all times by the movements of the tonearm such as the starting after zero balance has been completed, cancellation of muting when the tonearm lands on a record, and the returning of the tonearm. So, for this machine the following methods of repair are generally applicable.

1) Remove the turntable.
2) Turn the set from the horizontal to the vertical position.

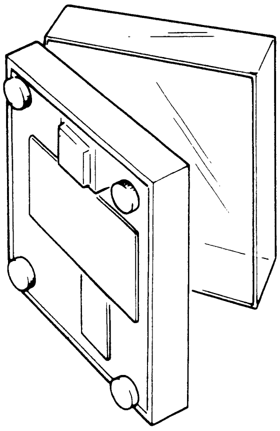


Fig. 8

3) Carry the tonearm by hand on to the tonearm rest and switch the POWER on. When the hand is released, the tonearm moves to the return region due to the weight of the rear portion of the tonearm.
4) When the POWER is on, slowly move and lay the tonearm in the horizontal position against the frame, and from there by slowly lowering to the frame, the zero balance will be set and the STAND BY lamp will turn off. Refer to Fig. 9.

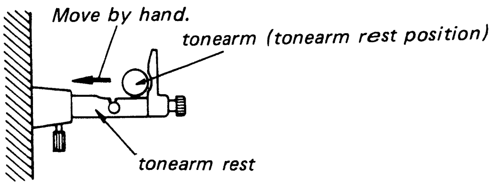
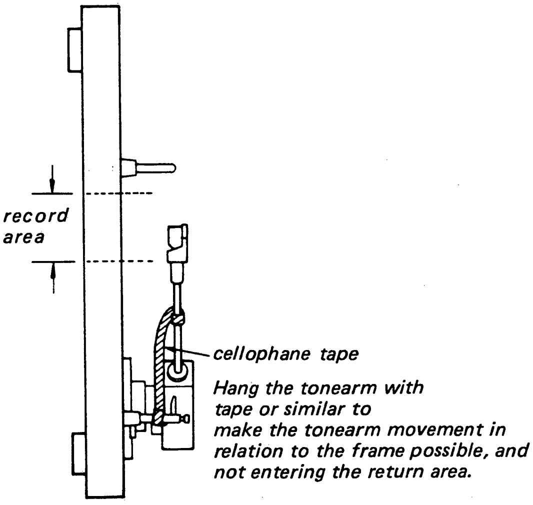


Fig. 9

5) Then, carry the tonearm by hand from the tonearm rest to the record area and as illustrated in Fig. 10, hang it in the air with a cellophane tape.


record area
cellophane tape

Hang the tonearm with tape or similar to make the tonearm movement in relation to the frame possible, and not entering the return area.

Fig. 10

6) In this position, the repair is possible even though the operation is imperfect.
But, since the imperfectness of the operation in this state, make sure to carry out the final checks and adjustments after the set has been placed back in the horizontal position and all repairs have been completed. Because the turntable has been removed, the rate of rotation will not be correct. After repairing, place the set in the horizontal position, and make the necessary adjustments with the turntable replaced.

1-7. CIRCUIT DESCRIPTION

1-7-1. When POWER is on

A reset pulse is generated at Q110 in the power-supply circuit and is routed to IC412. The polarity-reversed pulse $\overline{\text{RESET}}$ at the output of IC412 is applied to terminal 3 of the CPU. The CPU starts processing the program from the very first step when the $\overline{\text{RESET}}$ pulse turns off or resets to "1".

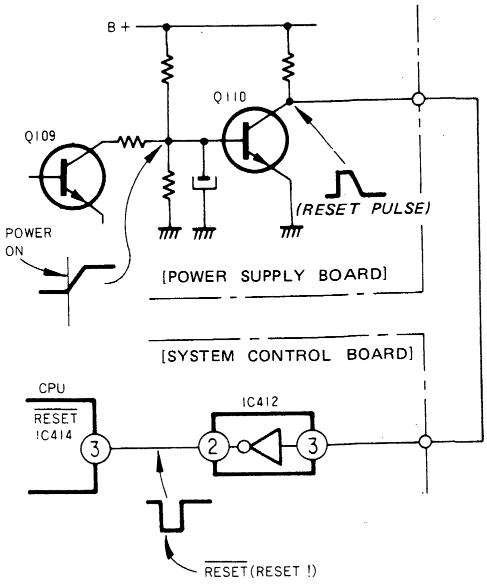

B+
Q110
Q109
POWER ON
(RESET PULSE)
[POWER SUPPLY BOARD]
[SYSTEM CONTROL BOARD]
CPU
RESET
IC414
3
IC412
2
3
RESET (RESET !)

Fig. 11

1-7-2. Program

After starting processing the program, the CPU processes the program roughly in the following order.

—PROGRAM FLOWCHART—

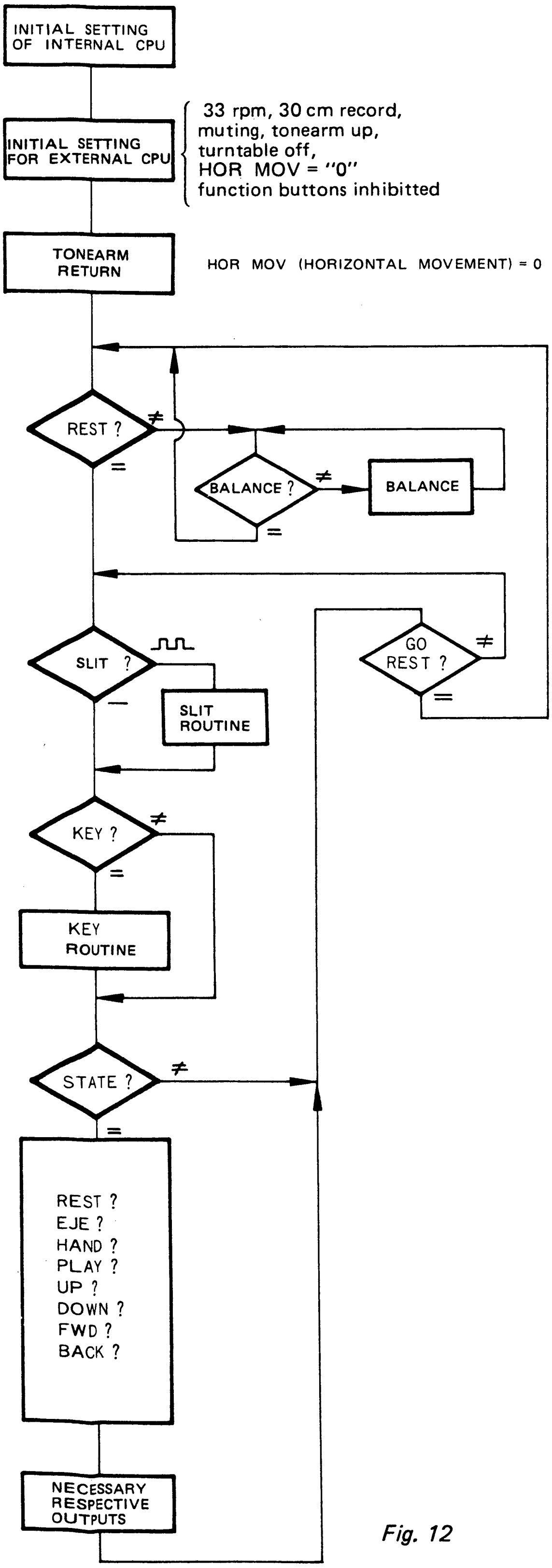

INITIAL SETTING OF INTERNAL CPU
INITIAL SETTING FOR EXTERNAL CPU
33 rpm, 30 cm record,
muting, tonearm up,
turntable off,
HOR MOV = "0"
function buttons inhibitted
TONEARM RETURN
HOR MOV (HORIZONTAL MOVEMENT) = 0
REST ?
≠
=
BALANCE ?
≠
=
BALANCE
SLIT ?
SLIT ROUTINE
GO REST ?
≠
=
KEY ?
≠
=
KEY ROUTINE
STATE ?
≠
=
REST ?
EJE ?
HAND ?
PLAY ?
UP ?
DOWN ?
FWD ?
BACK ?
NECESSARY RESPECTIVE OUTPUTS

Fig. 12

1-7-3. Details of Operation

1) Initial Setting of Internal CPU

The memories of RAM in CPU are erased.

2) Initial Setting for External CPU

Control Panel:
SPEED lamp: "33" lights up
UP/DOWN lamp: Lights up (instantaneous until set up)
STAND BY lamp: Lights up (instantaneous until set up)
STYLUS FORCE display: dependent on control setting on panel. From 0.5–3.0g in 0.1g steps.

3) Tonearm Return

If the tonearm is at any position other than on the tonearm rest when the POWER switch is just thrown, the tonearm will return to the tonearm rest, because the CPU commands HOR MOV=0. This operation only happens following POWER ON.

Refer to the program flowchart above for this function. The tonearm return circuit is shown in Fig. 13.

The input HOR MOV D/A=0 means the following:

HOR MOV D/A=F ..... tonearm advances: (1111)
$\frac{F}{2} = 8$ . . . tonearm stops: (1000)
0 ..... tonearm returns: (0000)

This D/A (digital to analog) conversion output is made in IC419 on receipt of the digital datum from the CPU.

The HOR MOV D/A is shown as follows:
While the tonearm is in the return mode the D/A shown generates 0000 at 0, that is 4 BIT. Further, the O_H data bus is converted bit by bit for other IC's inputs. The necessary voltage for the returning operation, as shown in Fig. 13, is a low value of about 0.2V. The returning speed is fixed by the resistance value of R250.

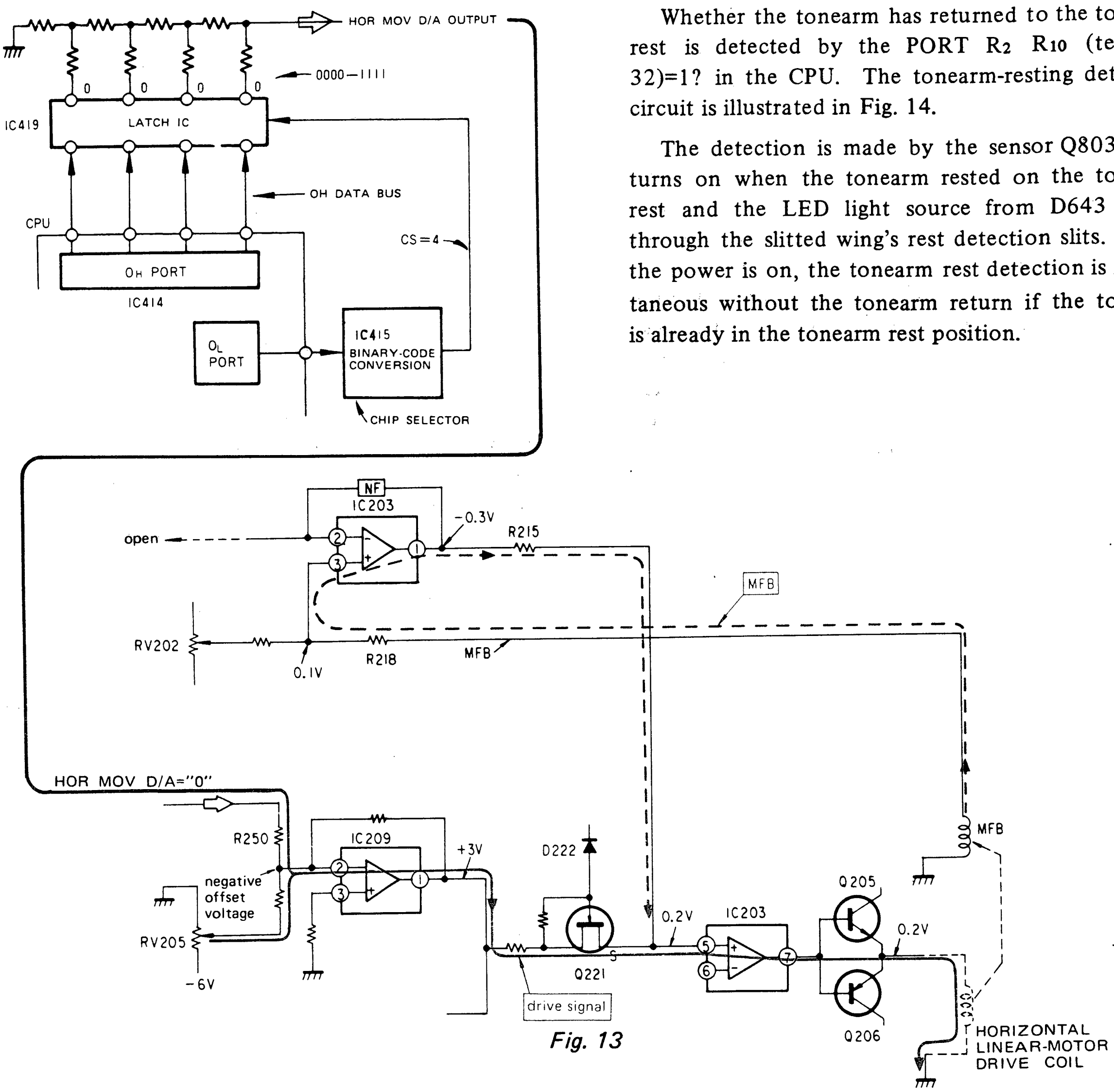

HOR MOV D/A OUTPUT
0000—1111
0
0
0
0
IC419
LATCH IC
OH DATA BUS
CPU
CS=4
OH PORT
IC414
OL PORT
IC415
BINARY-CODE CONVERSION
CHIP SELECTOR
NF
IC203
open
-0.3V
R215
MFB
RV202
R218
MFB
0.1V
HOR MOV D/A="0"
R250
IC209
+3V
D222
negative offset voltage
RV205
-6V
Q221
drive signal
S
0.2V
IC203
Q205
0.2V
Q206
MFB
HORIZONTAL LINEAR-MOTOR DRIVE COIL

Fig. 13

4) Tonearm Resting Detection

Whether the tonearm has returned to the tonearm rest is detected by the PORT R_2 R_{10} (terminal 32)=1? in the CPU. The tonearm-resting detection circuit is illustrated in Fig. 14.

The detection is made by the sensor Q803 which turns on when the tonearm rested on the tonearm rest and the LED light source from D643 passes through the slitted wing's rest detection slits. When the power is on, the tonearm rest detection is instantaneous without the tonearm return if the tonearm is already in the tonearm rest position.

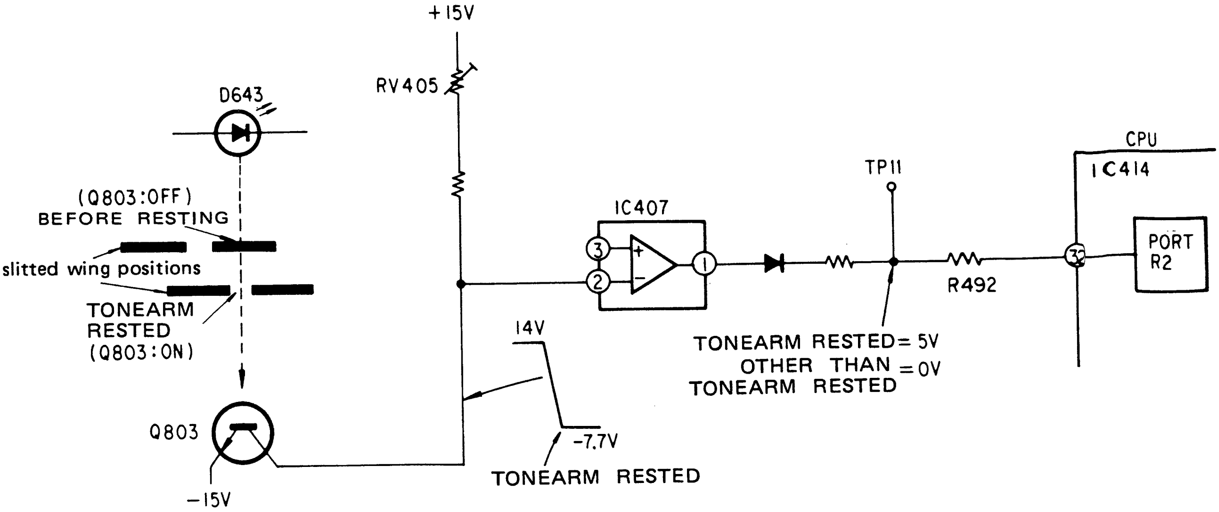

+15V
RV405
D643
(Q803:OFF)
BEFORE RESTING
slitted wing positions
TONEARM RESTED
(Q803:ON)
Q803
-15V
14V
-7.7V
TONEARM RESTED
IC407
TP11
R492
CPU
IC414
PORT R2
32
TONEARM RESTED= 5V
OTHER THAN TONEARM RESTED =0V

Fig. 14

5) Zero Balance

When the tonearm comes to the tonearm rest, the tonearm zero balance is set, while maintaining the tonearm lightly in the direction of the tonearm rest so that the tonearm does not go in the direction of the turntable. The zero balancing is the process performed when the weight of the end of the tonearm within the specified limit is detected and the data used for automatic balancing is wrote in the RAM in the CPU. This is carried out by way of the circuit in Fig. 15. When the tonearm rested on the tonearm rest, the loop in Fig. 15 which has been separated from the CPU is completed. Now, let it be assumed that the zero balance has been made with the shell (cartridge) before the power has been applied, and further assume that the posture of the tonearm is horizontal.

So, when the power is switched on with the tonearm in the tonearm rest position, the above-mentioned feedback loop is formed and from the zero-balance detection area the "balanced" information is obtained and the output voltage of Q204 becomes zero, because the current to the linear-motor balance(stylus force) coil is unnecessary.

This condition is obtained at the following times: when a cartridge (including shell) of 23g without a subweight is used.

However, this situation cannot in fact occur, for the following reason:

Cartridge (shell incl.) 12–21g: subweight not used (12g standard)

Cartridge (shell incl.) 21–31g: subweight used.

Under this arrangement the cartridge-side end of the tonearm, which is always set in the UP position, has to be lowered to the balance position.

So, when the tonearm is at the tonearm rest with the power on, a negative voltage is applied to the balance coil (arm DOWN direction) from Q204.

This machine is so adjusted that with a 12g cartridge (shell incl.) the tonearm is zero balanced and horizontal on the tonearm rest. In other words, with a cartridge weight above 12g, the tonearm is held with a very slight downward slant from the horizontal position. (the precise degree of incline varies according to the servo-loop gain.)

The weight of the cartridge can be measured by calculating the amount of incline of the tonearm (amount of incline within the limitation of servo linear operation), since this directly indicates the weight of the shell section.

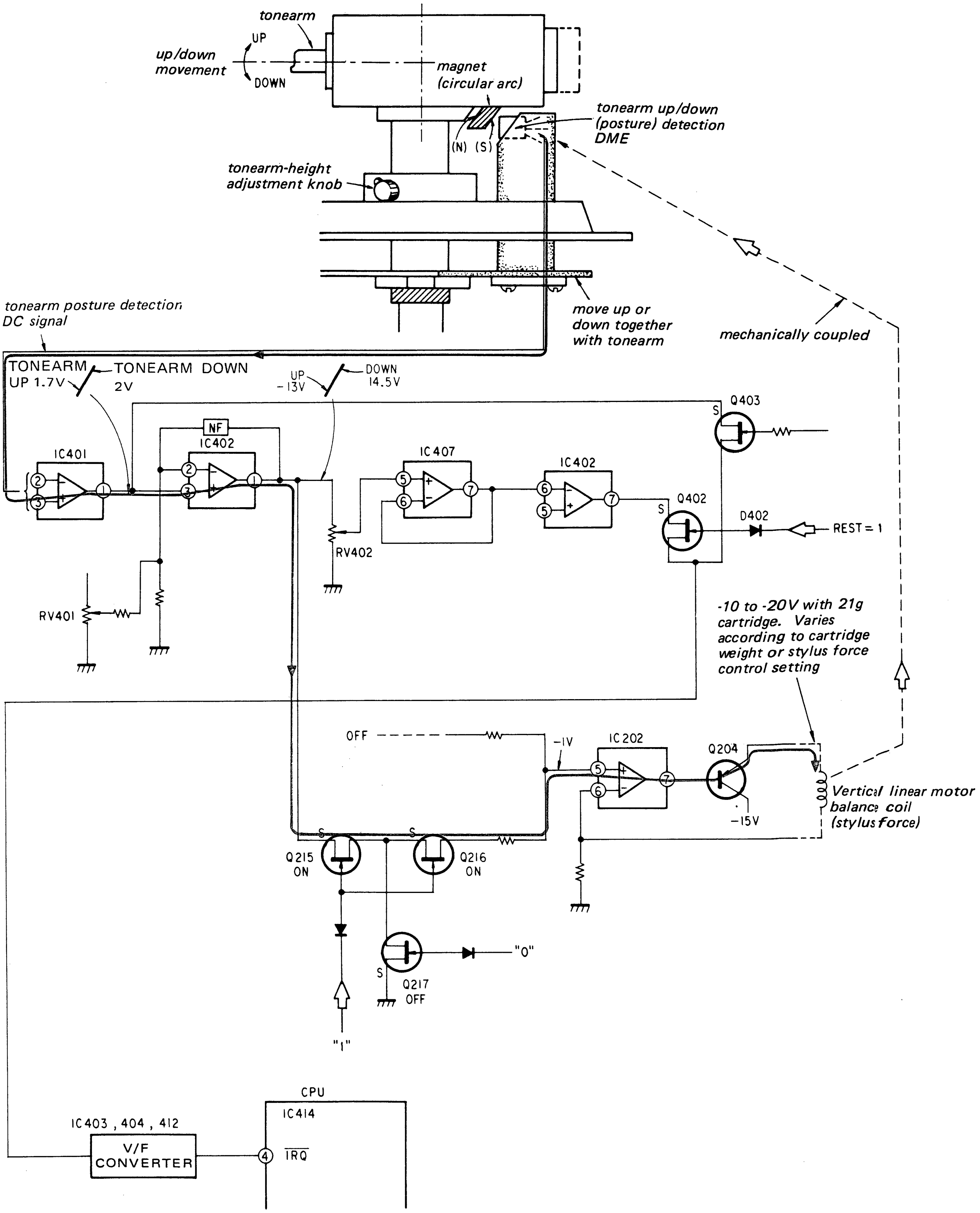

tonearm
UP
up/down movement
DOWN
magnet (circular arc)
tonearm up/down (posture) detection DME
(N) (S)
tonearm-height adjustment knob
move up or down together with tonearm
mechanically coupled
tonearm posture detection DC signal
TONEARM UP 1.7V
TONEARM DOWN 2V
UP -13V
DOWN 14.5V
NF
IC401
IC402
IC407
IC402
Q403
Q402
D402
REST = 1
RV402
RV401
-10 to -20V with 21g cartridge. Varies according to cartridge weight or stylus force control setting
OFF
-1V
IC202
Q204
-15V
Vertical linear motor balance coil (stylus force)
Q215 ON
Q216 ON
Q217 OFF
"0"
"1"
IC403, 404, 412
V/F CONVERTER
CPU
IC414
IRQ

Fig. 15

6) About the DME

The DME (Divider-type Magnetic-sensitive Element: DM101A) is a three-terminal thin-film device with strong magnetic properties. The output voltage changes by the direction of the magnetic field. This situation is similar to that where a variable resistor is caused to rotate.

When there is no magnetic field as in Fig. 16, at the point Vcc/2 there is a neutral-potential point. When a magnetic field is brought near the device, the potential changes in accordance with the direction of the magnetic field.

The total resistance value is 1.5kohms (range of 1.2–1.9 kohms). Also, the voltage variation to be utilized is 4.7% of the applied voltage.

In this machine, the device is used in the potential area shown by the broken thick line in Fig. 16.

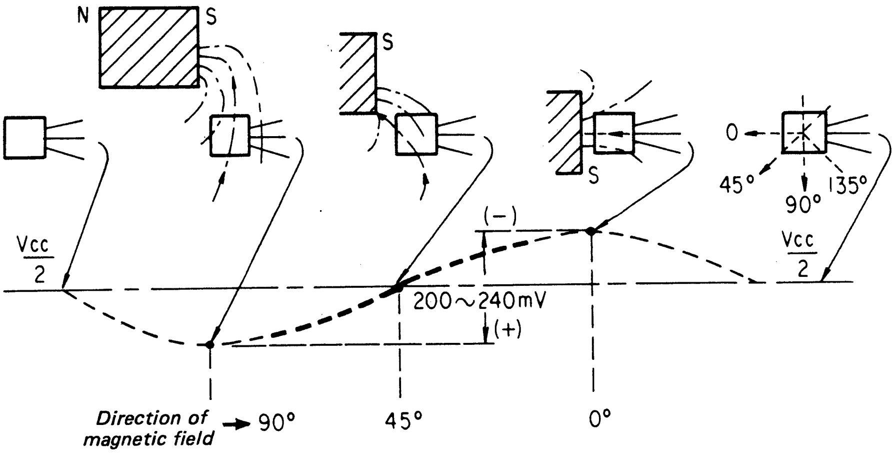
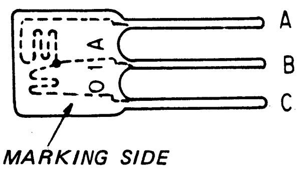

N
S
S
S
0
45°
90°
135°
Vcc/2
Vcc/2
(−)
200～240mV
(+)
Direction of magnetic field
90°
45°
0°

Fig. 16


A
B
C
MARKING SIDE

The direction of the internal membrances are set off at 90° as indicated by the dotted lines.

Fig. 17

INSTALLATION:
The DME has MARKING sides FACING outside.

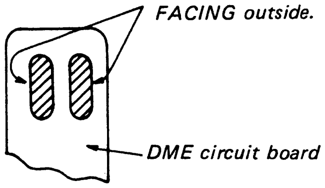

DME circuit board

Fig. 18

7) Tonearm Posture Detection

The tonearm posture signal enters the $\overline{\text{IRQ}}$ terminal of the CPU as a "frequency" by the V/F conversion circuit.

When the weight of the cartridge is 12g, the frequency when the tonearm is horizontal is set at 2,400±20Hz. Q401 in Fig. 19 is the feedback route and blocking oscillation is generated by IC403 and IC404.

When the blocking at the input side is released, the frequency is decided by the input DC voltage which biases it and the constant C.R.

The frequency is proportional to the input DC voltage (* mark) and inversely proportional to cartridge weight. As in Fig. 19, with a 12g cartridge at 2,400Hz, this signifies that the CPU knows that 2,400Hz=12g. This is counted by the balance counter and memorized internally.

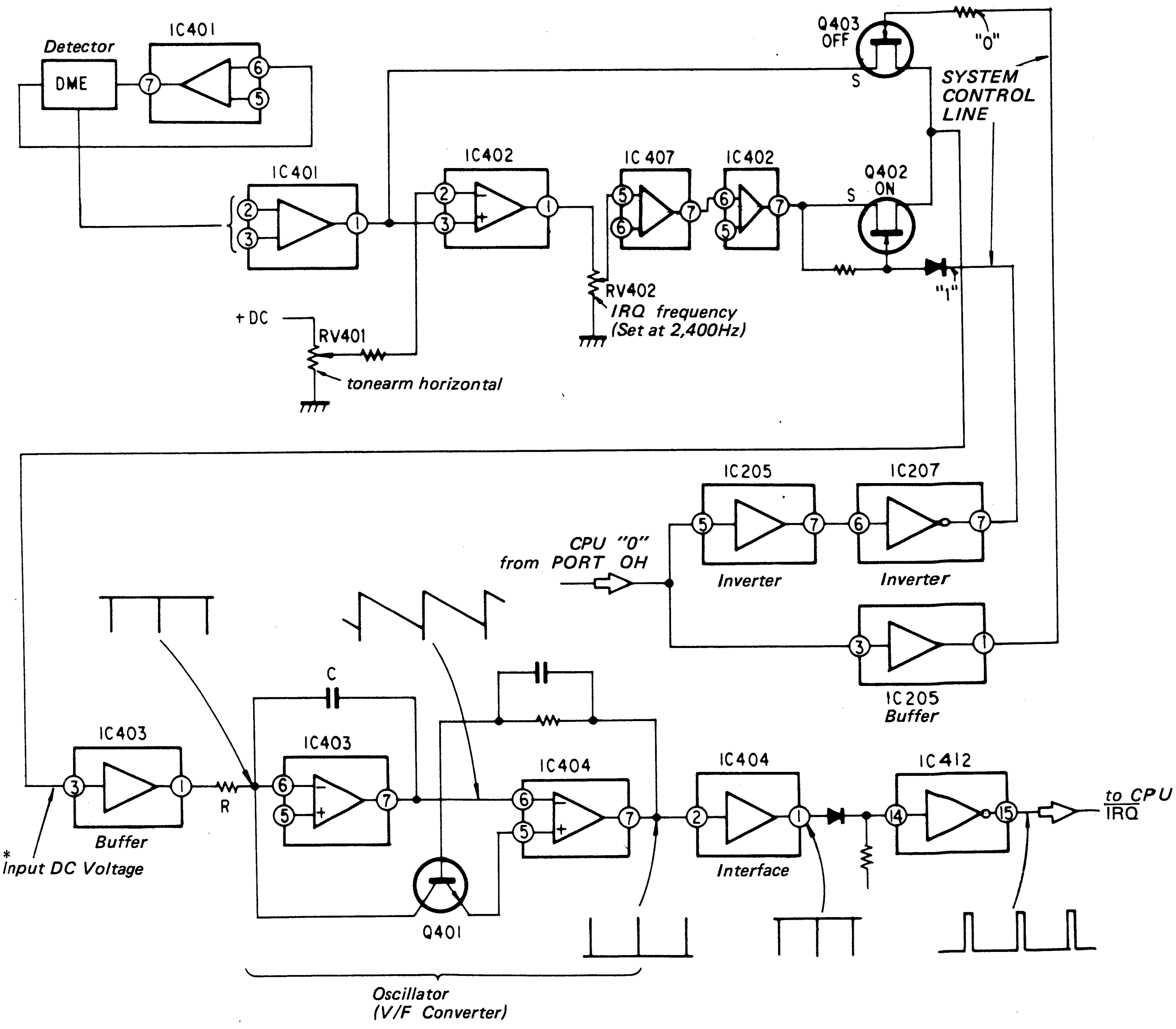

IC401
Detector
DME
IC401
IC402
IC407
IC402
Q403
OFF
S
"0"
SYSTEM
CONTROL
LINE
Q402
S ON
"1"
+DC
RV401
tonearm horizontal
RV402
IRQ frequency
(Set at 2,400Hz)
IC205
IC207
CPU "0"
from PORT OH
Inverter
Inverter
IC205
Buffer
C
IC403
IC403
IC404
IC404
IC412
R
Buffer
*
Input DC Voltage
Q401
Interface
to CPU
IRQ
Oscillator
(V/F Converter)

Fig. 19

8) STANDBY Lamp

During the zero balancing the STANDBY lamp is turning on, and all the buttons on the control panel are disabled by the CPU. In other words, this means that if the STANDBY lamp is not turned off then execution of the program cannot go ahead. The summary of the above-mentioned outline is;

The tonearm returns to the tonearm rest when POWER is turned on.

When the zero-balancing is finished, SPEED is set to "33" (lamp lights up) and STYLUS FORCE display is of the value within "0.5–3.0g".

9) KEY

When the zero balancing is finished, the CPU will monitor the KEYs (each function switch of the control panel). Monitoring is limited only to the necessary input when the tonearm is on the tonearm rest.

0 in the following table means that input is possible (the CPU will accept it), while x means rejection inside the CPU.

● CLEANER		O
● 45 – SPEED – 33		O
● REPEAT		O
● MEMORY	RETURN	x
	LEAD IN	x
● AUTO START/STOP		O
● MOTOR ON/OFF		O
● UP/DOWN		x
● ARM : ⬅		O
● ARM : ➡		x

For KEY IN monitoring, the CPU sets the necessary KEY power at "0" and when the function button is pushed, monitoring is carried out by the "0" appearing at the input terminal after passing the switch.

Necessary KEY power: CPU's PORT P (output)
Input Terminal: CPU's PORT K (input)

Port P output when tonearm is at the tonearm rest:

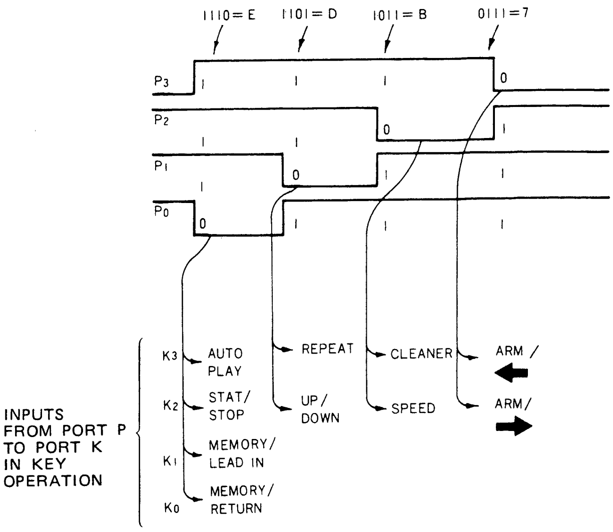


Fig. 20

Note: The port P output is put out repeatedly and stably when the tonearm is at the tonearm rest, but is erased when the CPU transfers to the execution mode from the key-stroke routine when each function button is pressed. In other words, when not operating the function button the waveform illustrated above is generated. Also, the display data when the tonearm rested on the tonearm rest are erased inside the CPU.
To summarize, if the function buttons can be operated, then zero balancing has been completed.

10) CLEANER

When the CLEANER button is pushed, the cartridge stulus cleaner cleans the stylus with the tonearm rested on the tonearm rest. The brush is rotated by a cleaner motor unconnected with the lowering of the tonearm. The reason why the tonearm is stabilized on the the tonearm rest while cleaning is that a slight backing motion is set up where HOR MOV (horizontal movement) =4. The cleaner motor is turned on by the signal Ro (terminal 22 =ϕ] oof Port Ro0, 1 of the CPU, and the CLEANER lamp turns on at the same time. The cleaner will only operate when the tonearm is on the tonearm rest position.

11) LOOP

If there is no input from function button with the tonearm rested on the tonearm rest, then the CPU begins looping. This operation compares the status of the CPU and the present tonearm status, by entering the section marked STATE? on the program flowchart. When all checks have finished, it returns again to the slit verification routine.

1-7-4. AUTO PLAY

When the AUTO PLAY button is pressed, everything starts to operate automatically.

Press the AUTO PLAY button once:
START lamp lights up.
AUTO PLAY (right-side) lamp lights up
(Motor starts rotating at 33rpm)
UP lamp lights up.

The AUTO PLAY button cannot be cancelled until the tonearm is lifted up in the tonearm rest position. When the tonearm is up, cancel by pressing the AUTO PLAY button again.

The tonearm rises and moves in a horizontal direction towards the record surface. At this point, if no record has actually been placed on the turntable, then the tonearm will return back after it has moved out 2cm from the tonearm rest. This is because the CPU signals a return instruction through the record-presence monitor circuit.

1) Record Monitoring (and Size Monitoring).

Infrared rays are permanently irradiated on top of the turntable from the three diodes mounted to the left of the tonearm pivot. The infrared rays which pass through the turntable-mat slit and are bent by the turntable prism, are then detected by three phototransistors mounted on the auto-size board on the frame under the turntable. No light can be seen because infrared rays are outside the visible spectrum.

The outputs from the three phototransistors are switched on and off following the turntable rotation, so pulses are generated which serves as the input signals to the port R_3 of the CPU and is detected in the following manner:

The relation between port R_3 and record size:

	terminal 35	terminal 36	terminal 37	record
PORT R_3	0	0	0	30cm
	1	0	0	25cm
	1	1	0	17cm
	1	1	1	none

Example: 30 cm record

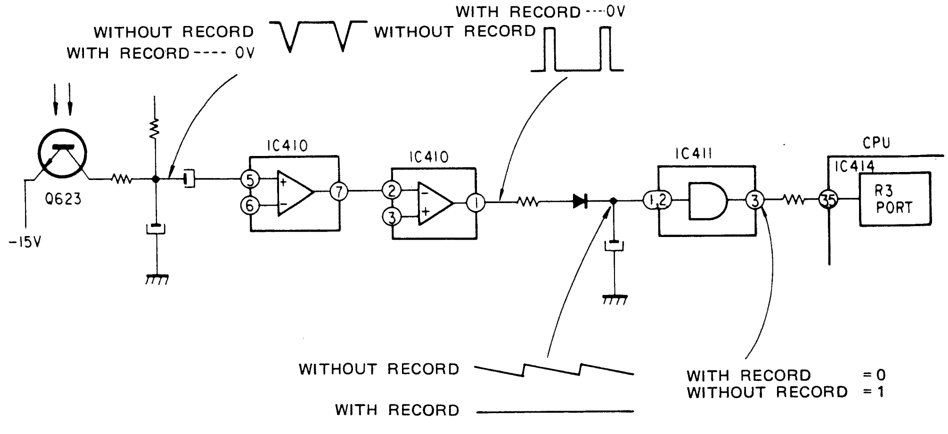


Fig. 21

2) Target of Tonearm Motion

When the tonearm moves toward the record, the position of the record lead-in is decided by counting the slitted-wing's slits which rotate together with the tone arm's horizontal linear-motor section. The target is programmed as follows: The target is the record area.

The slit number x is the lead-in target.

In other words, when the tonearm is moving toward the record, the horizontal-drive voltage is established at "F" for forward motion until the slit counting has reached the target slit. When the record area is reached, the CPU stops the tonearm, by changing from "F" to "8" (a central value between forwarding and returning the tonearm) which signifies stoppage.

The slits consist of an arrangement of 300 narrow slits of 0.12mm width each.

Note: If the slits are dirty or dusty, the tonearm will not be able to count the number of slits. Seeing that the lead-in position has not been reached, it will continue travelling toward the center of the record.

3) Slit-Count Section

Slit-Count Circuit is illustrated in Fig. 22:

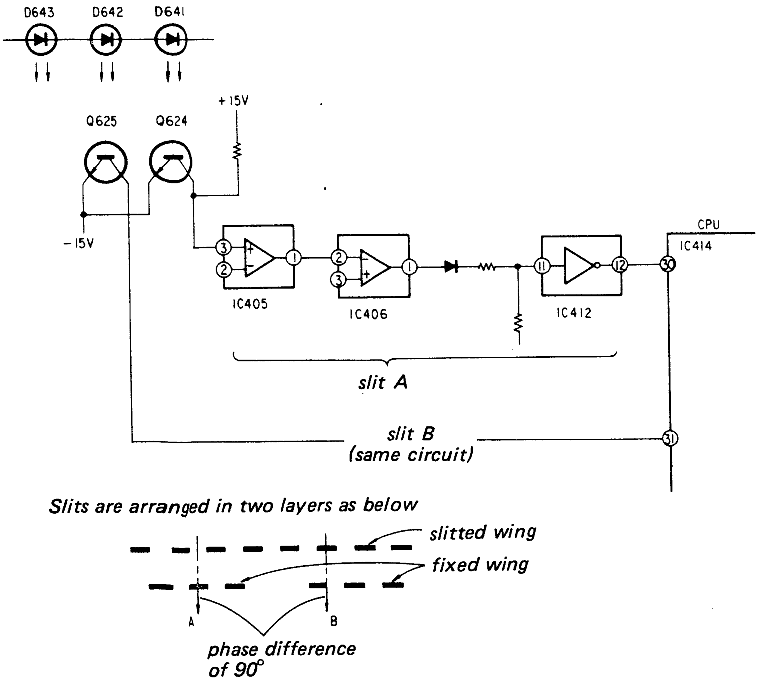
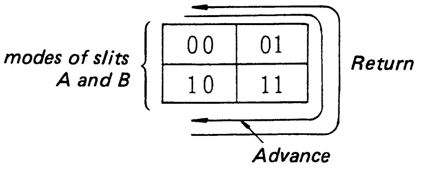


Fig. 22

For this reason, when slits A and B are compared phase-wise, both forward and backward motions can be detected.



4) Lead In

When the tonearm reaches the record area, it lowers to the record surface.

When in forward mode, a fixed voltage has already been applied to the balance (stylus force) linear-motor coil. An UP voltage is also applied to the drive coil and this becomes the DOWN voltage when cancelled at the record area. When the stylus landed on the record, the landing signal is picked up by IC208 and the drive coil is now switched to the servo operation which in turn acts as the damper during the record trace mode. Also, the muting is released.

5) End Detection

The record end is programmed by counting the number of slits. When the programmed number of slits have been counted, this means the record end position has been reached and the tonearm returns to the tonearm rest.

1-7-5.MEMORY

If the MEMORY button is pressed, while in the record area (after the lead-in position), the MEMORY lamps turn on and MEMORY LEAD IN or MEMORY RETURN can be programmed. The LEAD IN setting always precedes the RETURN. So even if mistakenly, RETURN is programmed first, or LEAD IN later, the CPU is programmed to cancel the instruction previous to that operation.

Note: The shortest MEMORY LEAD IN/RETURN is at the same slit position, but in this case the tonearm goes from DOWN → UP to RETURN. In AUTO PLAY with the memory programmed, the stylus will lead in at that position.

1-7-6. REPEAT

This button will decide the repeating of the MEMORY or fullplay.

The repeat operation can be made by the number of times the button is pressed to an upper limit of 15 times as a result of the 4-BIT counter used. When the REPEAT button is pressed 16 times, it returns to zero, i.e., no repeat. If it is pressed during the playback, that time is also added. Until this button is made to return by AUTO STOP, the repeating data is memorized in the CPU.

1-7-7. Stylus-Force Value D/A

The stylus force is decided in the stylus force circuit board. The stylus-force data is conveyed and added to the balance coil through Q218 in the linear-motor circuit board.

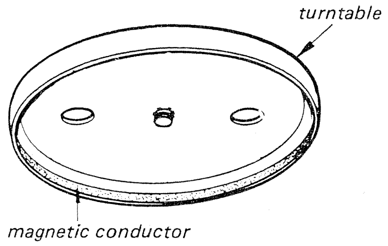
1-7-8. Main Motor (Turntable) Circuit

Here the instructions 33 or 45 and STOP or START are applied from the CPU. Otherwise it operates as a crystal-locked PLL servo.

SECTION 2
DISASSEMBLY

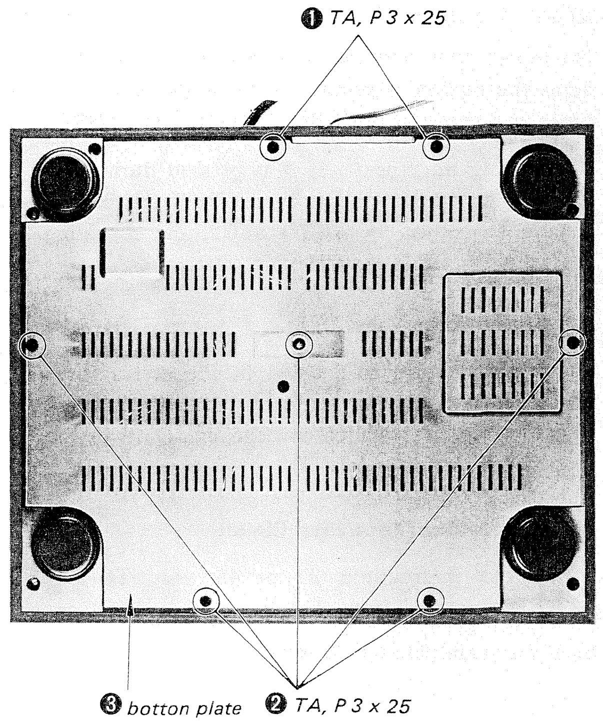
Note:
Follow the disassembly procedure in the numerical order given.

Note:
Be sure not to scratch and hurt the magnetic conductor coated on the inside wall of the turntable.

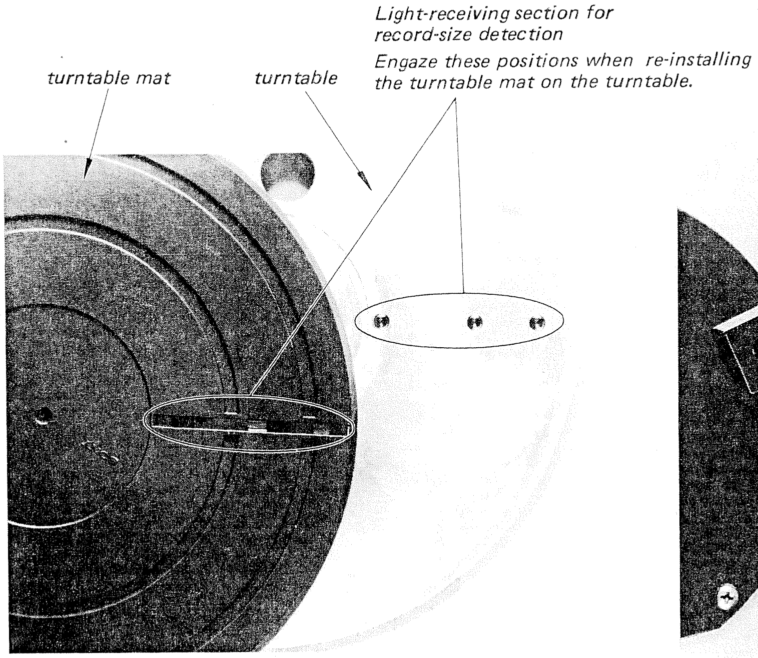

turntable
magnetic conductor

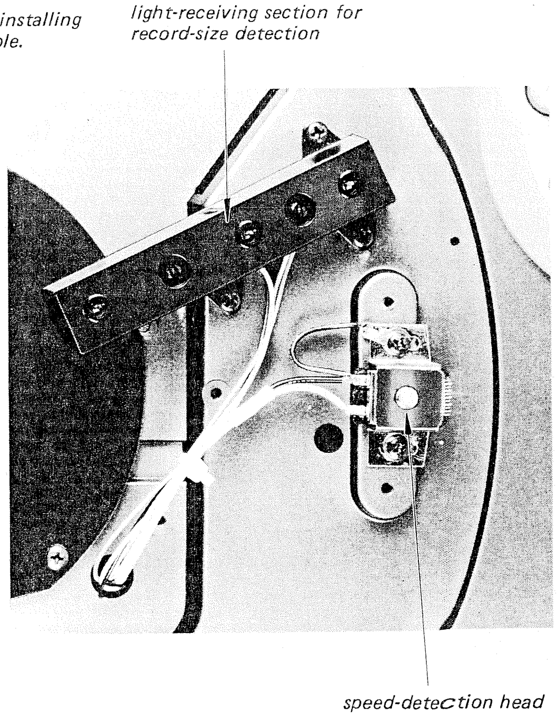
- Unplug the power cord.
- Remove the turntable.

BOTTOM PLATE REMOVAL


❶ TA, P 3 x 25
❸ botton plate
❷ TA, P 3 x 25

REFERENCE PHOTOS:


turntable mat
turntable
Light-receiving section for record-size detection
Engaze these positions when re-installing the turntable mat on the turntable.


light-receiving section for record-size detection
speed-detection head

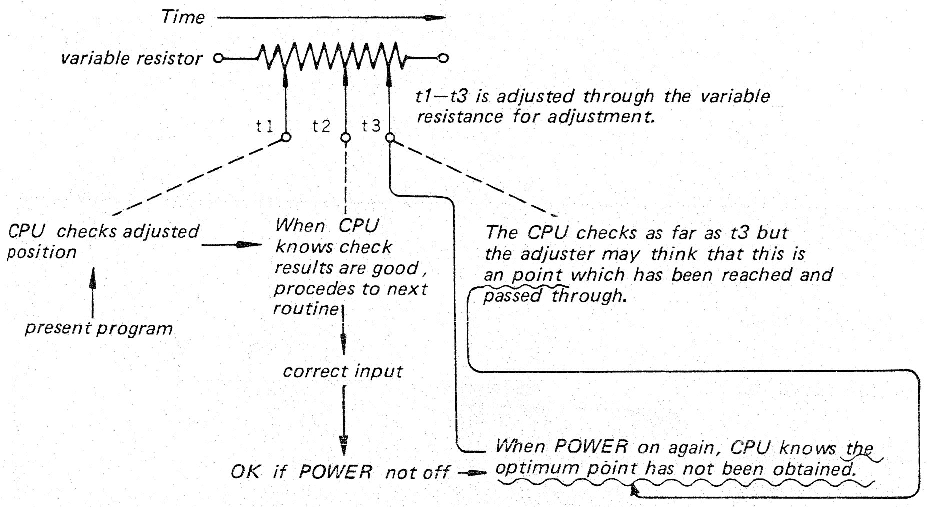
SECTION 3
ADJUSTMENTS

Notes on Making Adjustments

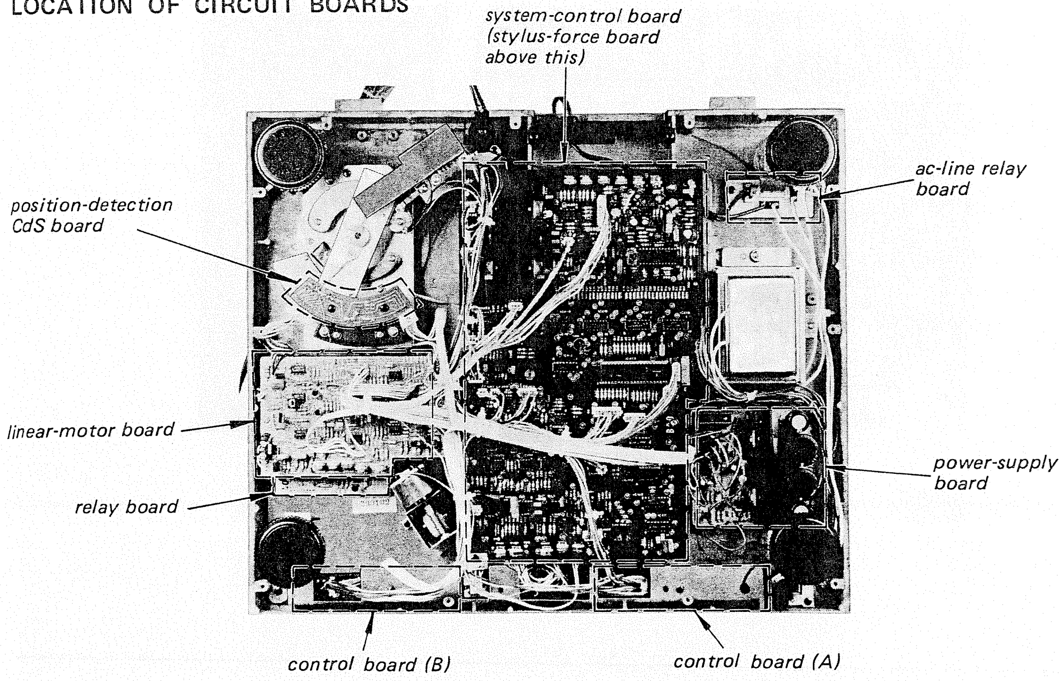
When making adjustments to machines with computers installed, take the following precautions:

The computer program operates on the following two systems:

1) The continuous check and review system
   ... Ex: function button input etc.
   Since the function button could be pressed at any time the program is made for continuous checking.
2) The alternative system is where, when one process is completed, it is committed to the memory and not reviewed.
   ... Ex: inputs for zero balancing etc.
   The important one is the later case.
   Fig. 21 is an example of an adjustment operation as it happens in time sequence.
   It is important, once all the adjustments have been made, to return to the initial status (POWER OFF) and allow the results of the new adjustments to be carried to the computer.


Time
variable resistor
t1
t2
t3
t1—t3 is adjusted through the variable resistance for adjustment.
CPU checks adjusted position
present program
When CPU knows check results are good, procedes to next routine
correct input
OK if POWER not off
The CPU checks as far as t3 but the adjuster may think that this is an point which has been reached and passed through.
When POWER on again, CPU knows the optimum point has not been obtained.

LOCATION OF CIRCUIT BOARDS


system-control board (stylus-force board above this)
ac-line relay board
position-detection CdS board
linear-motor board
relay board
power-supply board
control board (B)
control board (A)

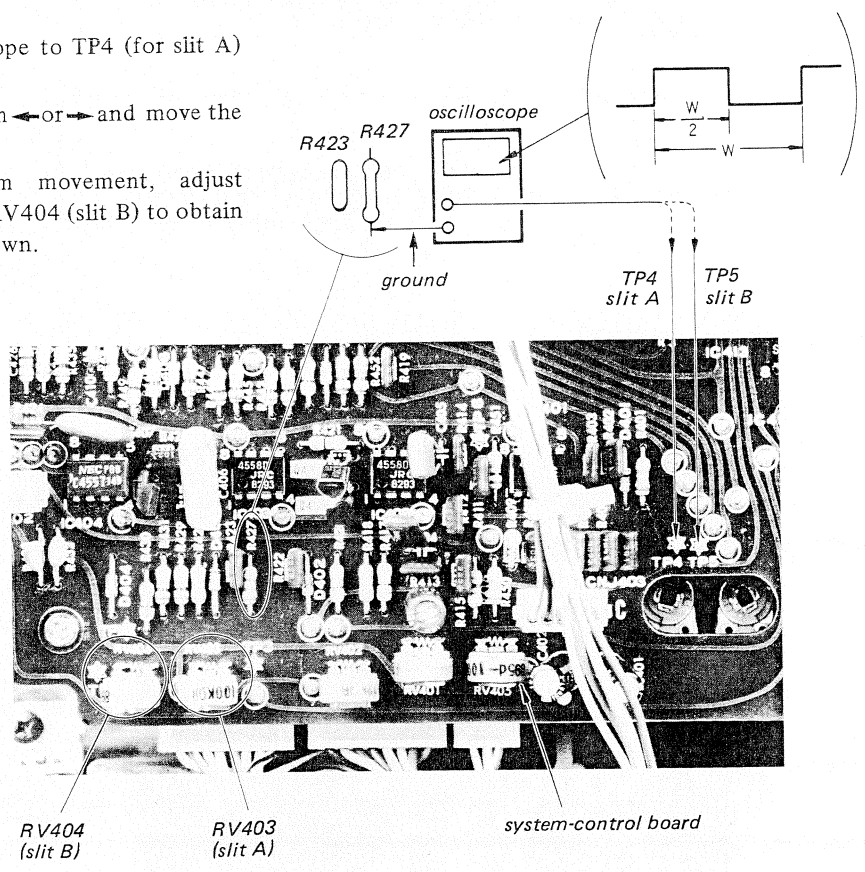
PRECAUTION:

1. Place the set on a horizontal place.
2. Put a cartridge on the tonearm.
3. Turn the POWER switch on.
   Wait until the tonearm returns on the torearm rest and the STANDBY lamp turns on and until the STANDBY lamp turns off when the zero-balance is automatically accomplished.
4. Proceed to the following adjustments.

SLIT A and SLIT B ADJUSTMENTS

Procedure:

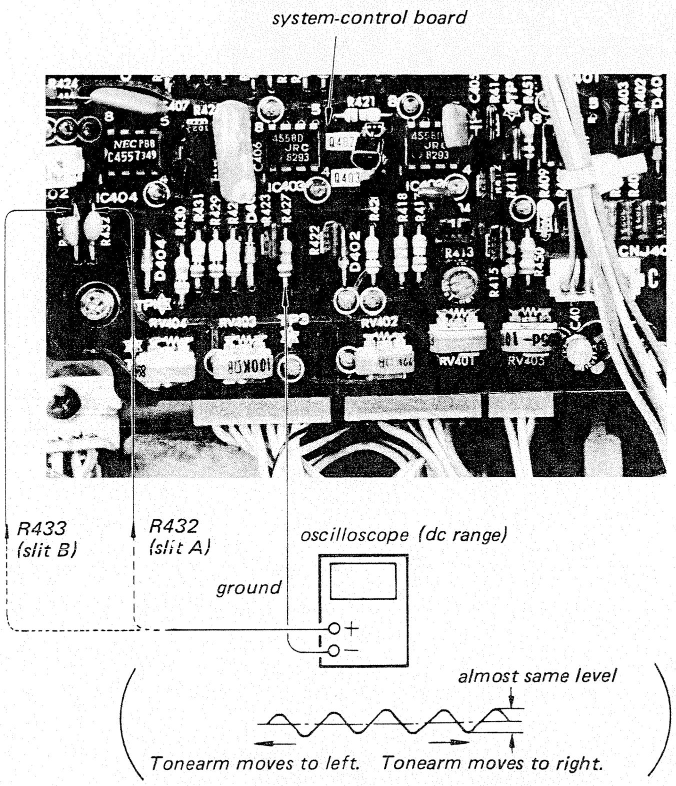
1. Connect an oscilloscope to TP4 (for slit A) or TP5 (for slit B).
2. Push the ARM button ◄ or ► and move the tonearm.
3. During the tonearm movement, adjust RV403 (slit A) and RV404 (slit B) to obtain the squarewave as shown.

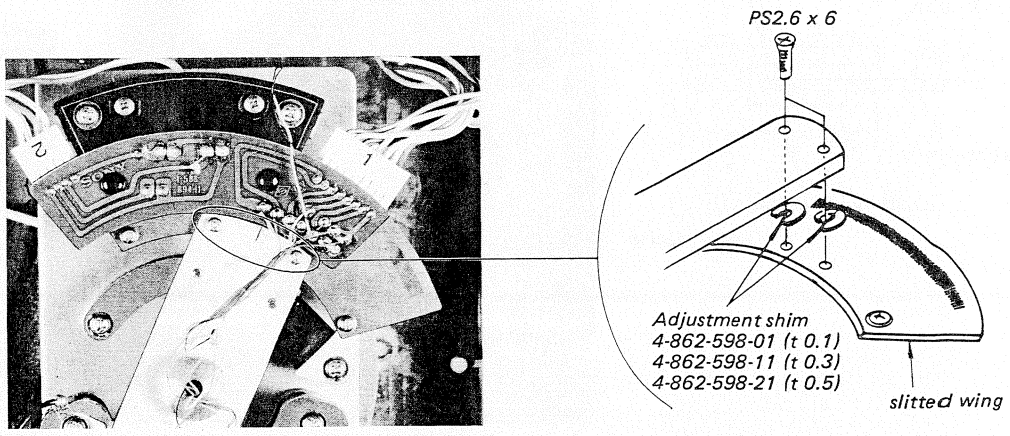

oscilloscope
R423
R427
W/2
W
ground
TP4
slit A
TP5
slit B
RV404
(slit B)
RV403
(slit A)
system-control board

SLITTED-WING POSITION ADJUSTMENT

Procedure:

1. Connect an oscilloscope to the points as shown below.
2. Push the ARM button ◄ or ► and move the tonearm.
3. Adjust the position of the slitted-wing with the adjustment shim so that an almost the same-level sine wave is obtained during the tonearm movement, i. e., the slotted-wing swing.


system-control board
R433
(slit B)
R432
(slit A)
oscilloscope (dc range)
ground
+
−
almost same level
Tonearm moves to left.
Tonearm moves to right.

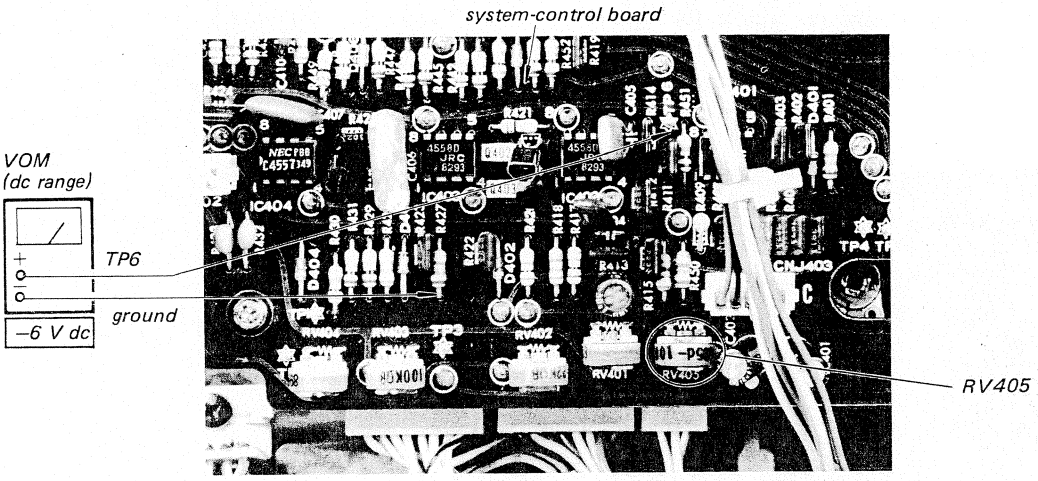

PS2.6 x 6
Adjustment shim
4-862-598-01 (t 0.1)
4-862-598-11 (t 0.3)
4-862-598-21 (t 0.5)
slitted wing

TONEARM REST SIGNAL ADJUSTMENT

Note: The arm-resting position has no effect to this adjustment.

Procedure:

1. Release the tonearm rest to free the tonearm.
2. Connect a VOM to the points as shown below.
3. Adjust RV405 to obtain −6Vdc.

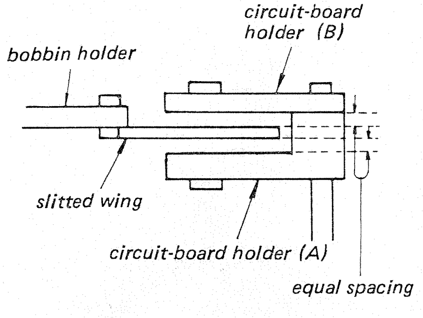

system-control board
VOM
(dc range)
+
−
TP6
ground
−6 V dc
RV405

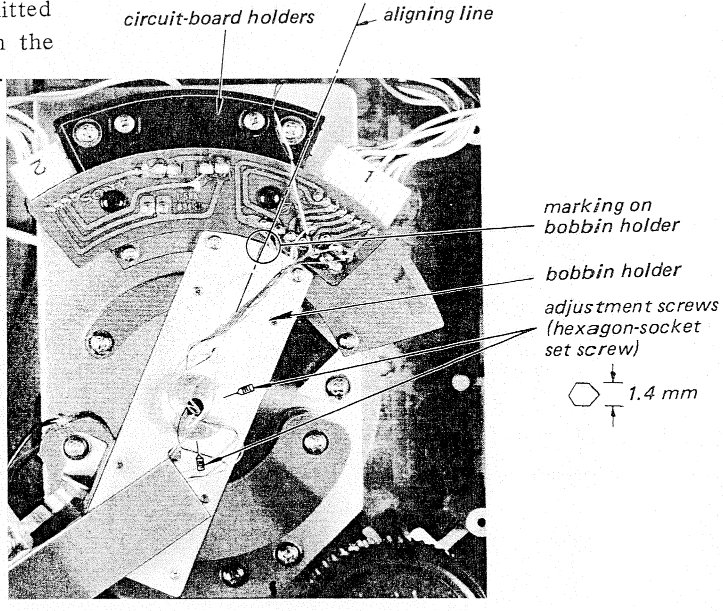
TONEARM REST POSITION ADJUSTMENT

Note: Perform this adjustment when the bobbin holder at the pivot of the tonearm is removed or moved.

Procedure:

1. Secure the tonearm on the tonearm rest.
2. Loosen the adjustment screws and align the edge of the circuit-board holder and the mark on the bobbin holder as shown.
3. Secure the bobbin holder so that the slitted wing passes through the center of both the circuit-board holders (A) and (B) as shown.


circuit-board holder (B)
bobbin holder
slitted wing
circuit-board holder (A)
equal spacing

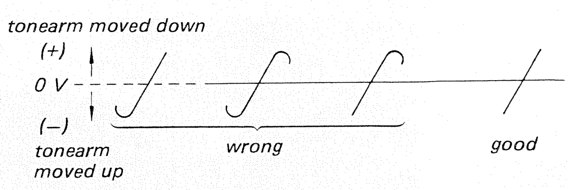

circuit-board holders
aligning line
marking on bobbin holder
bobbin holder
adjustment screws (hexagon-socket set screw)
1.4 mm

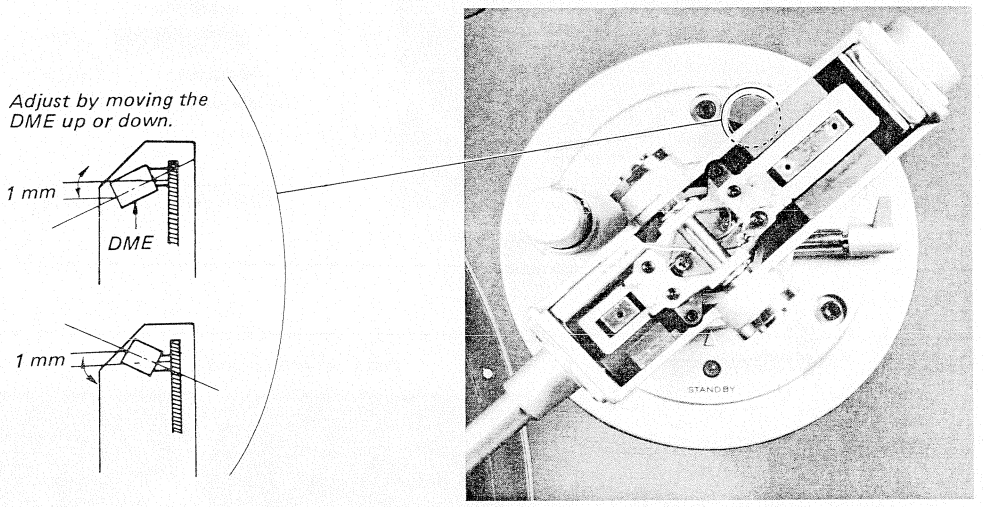
V/F LINEARITY ADJUSTMENT

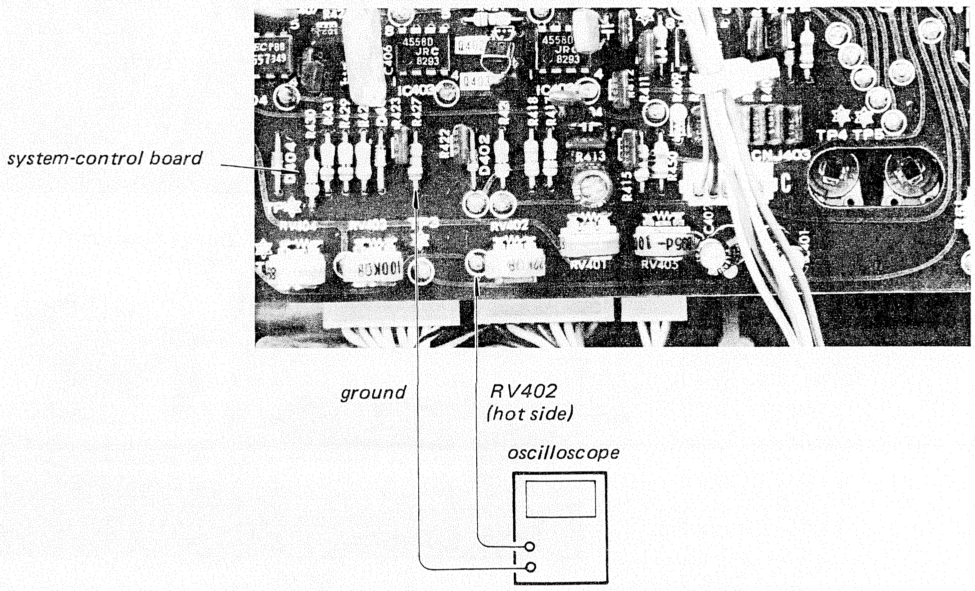
Note: The tonearm position signal (dc) generated in the DME varies according to the position of the DME. This dc voltage should maintain a linear characteristic.

Procedure:

1. Connect an oscilloscope to the points as shown below.
2. Place the tonearm to the tonearm rest, but do not secure on the rest.
3. Move the tonearm up and down by hand and check the waveform.
4. Adjust the position of the DME by about 1 mm ($1/64$") by using a chopstick through the opening to obtain the linear waveform.


tonearm moved down
(+)
0 V
(–)
tonearm moved up
wrong
good

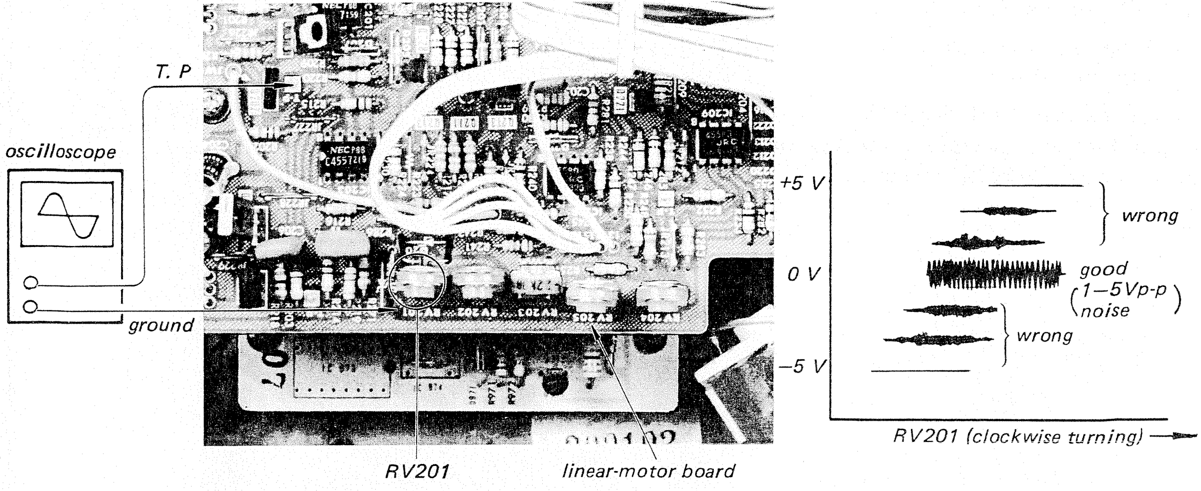

Adjust by moving the DME up or down.
1 mm
DME
1 mm
STANDBY


system-control board
ground
RV402
(hot side)
oscilloscope

TONEARM VERTICAL LINEAR-MOTOR OFFSET ADJUSTMENT

Procedure:

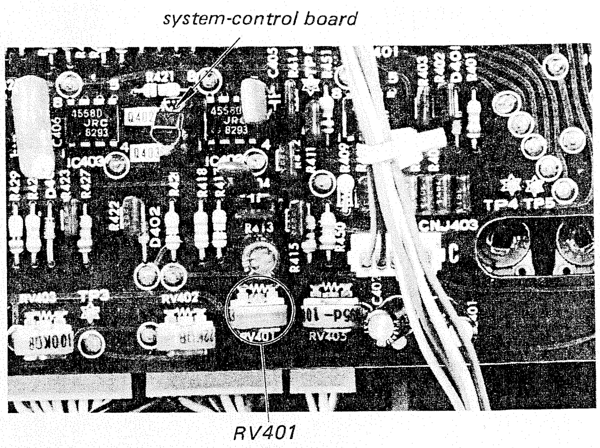
1. Connect an oscilloscope to the points shown below.
2. Place the tonearm to the tonearm rest, but do not secure on the rest.
3. Adjust RV201 to obtain a symmetrical waveform centered on 0V line as shown below.

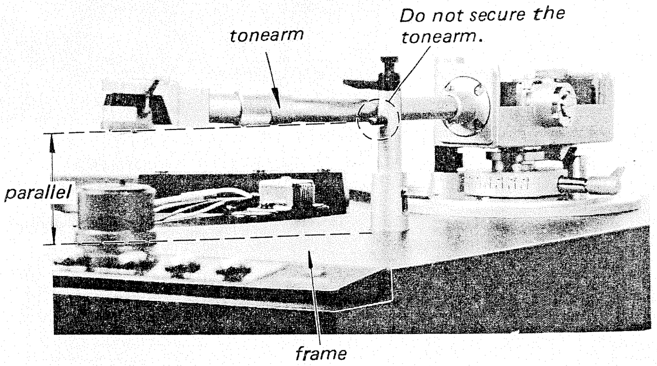

T. P
oscilloscope
ground
RV201
linear-motor board
+5 V
0 V
−5 V
wrong
good
(1−5Vp-p noise)
wrong
RV201 (clockwise turning)

TONEARM HORIZONTAL ADJUSTMENT

Procedure:

1. Put a cartridge weighing 12g with the stylus on the tonearm.
2. Place the tonearm to the tonearm rest, but do not secure on the tonearm rest.
3. Adjust RV401 so that the tonearm positions in parallel with the frame's face.
4. After the adjustment, recheck the tonearm vertical linear-motor offset shown above.

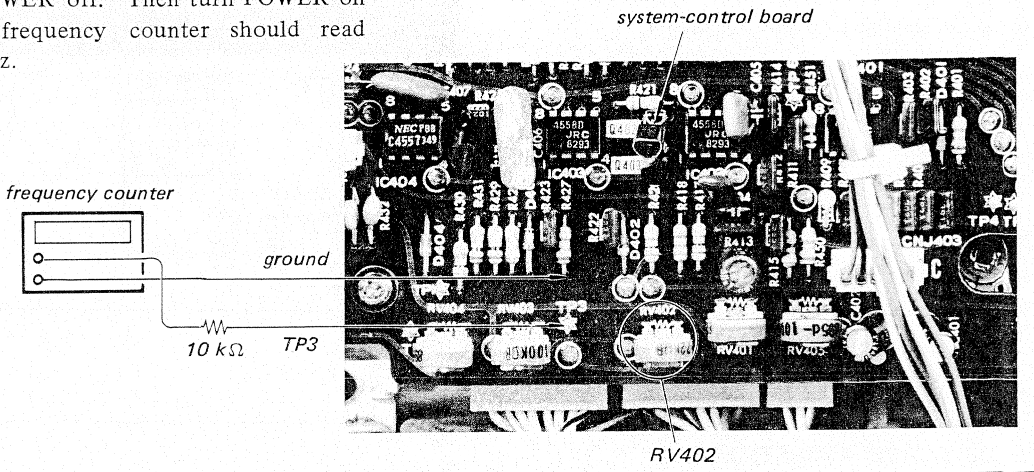

system-control board
RV401


tonearm
Do not secure the tonearm.
parallel
frame

IRQ FREQUENCY ADJUSTMENT

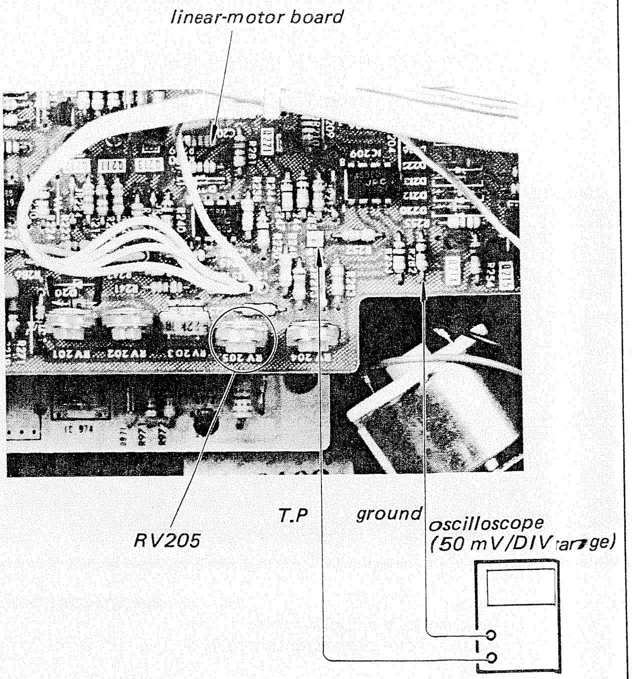
1. Put a cartridge weighing 12g with the stylus on the tonearm.
2. Place the tonearm to the tonearm rest, but do not secure on the rest.
3. The tonearm should be in parallel with the frame's face.
4. Connect a frequency counter to TP3 as shown below.
5. Adjust RV402 to obtain 2,400 ±20 Hz(2,380–2,420 Hz) reading on the counter.
6. Turn the POWER off. Then turn POWER on again, the frequency counter should read 2,400 ± 20 Hz.

Note: The frequency rises when the cartridge side is above the horizontal line.
The frequency lowers when the cartridge side is below the horizontal line.


system-control board
frequency counter
ground
10 kΩ
TP3
RV402

TONEARM-DOWN HORIZONTAL OFFSET ADJUSTMENT (1)

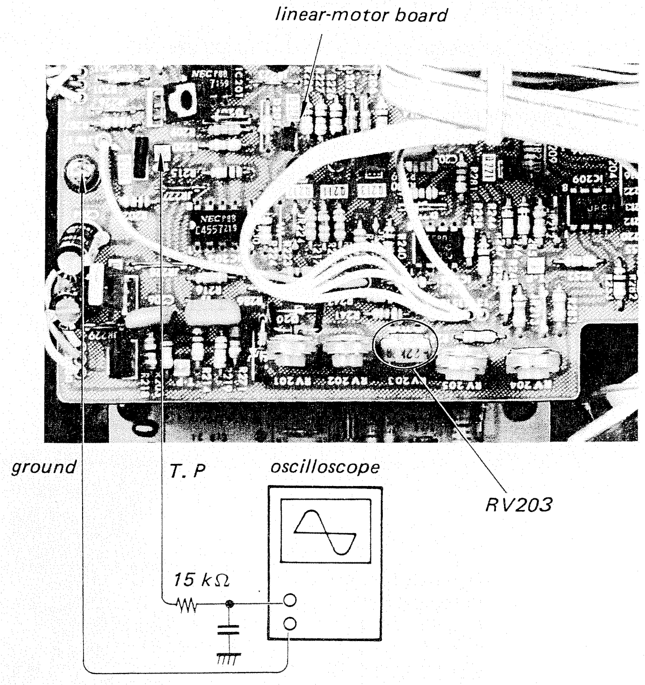
1. Connect an oscilloscope to the points as shown below.
2. Put a record on the turntable mat.
3. Hold the turntable so that it does not move.
4. Push the tonearm UP/DOWN button and place the cartridge on the record groove.
5. Adjust RV205 so that the voltage reading becomes 0V.


linear-motor board
RV205
T.P
ground
oscilloscope
(50 mV/DIV range)

VERTICAL-BALANCE OFFSET ADJUSTMENT

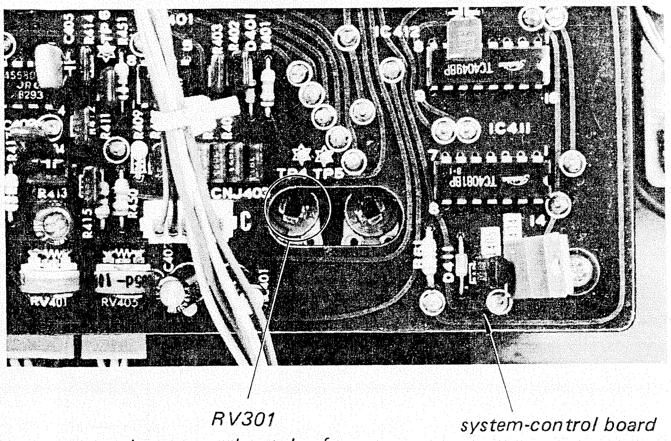
Note: Do not turn the STYLUS FORCE control during the adjustment.

1. Connect an oscilloscope to the points as shown below.
2. Put a record on the turntable mat.
3. Put the tonearm on the tonearm rest. The STANDBY lamp should turn on. Memorize the level of the waveform.
4. Push the tonearm UP/DOWN button and place the stylus on the record.
5. Adjust RV203 so that the waveform level becomes the level obtained in step 3.

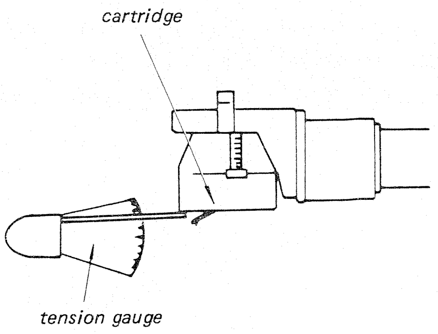

linear-motor board
ground
T. P
oscilloscope
RV203
15 kΩ

STYLUS FORCE ADJUSTMENT

1. Turn the STYLUS FORCE control for 3g.
2. Put the cartridge's edge on a tension gauge as shown below.
3. Adjust RV301 so that the tension gauge reads 3g.
4. Turn the STYLUS FORCE control for 0.5g.
5. Confirm that the tension gauge is reading 0.5g.

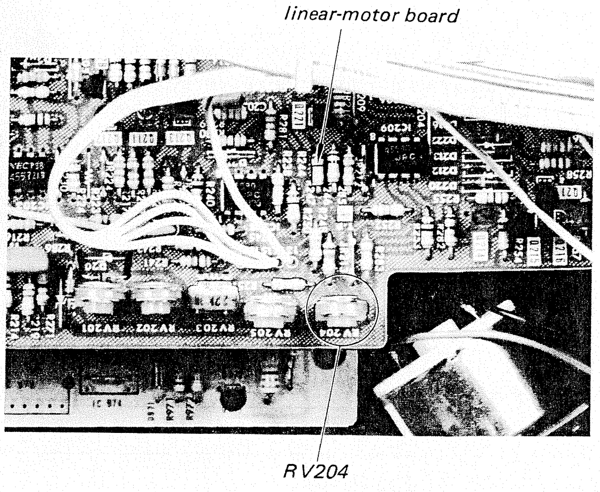

RV301
system-control board
IC411
RV401
RV403
TP4 TP5

RV301 locates on the stylus-force board above the system-control board


cartridge
tension gauge

INSIDE FORCE ADJUSTMENT

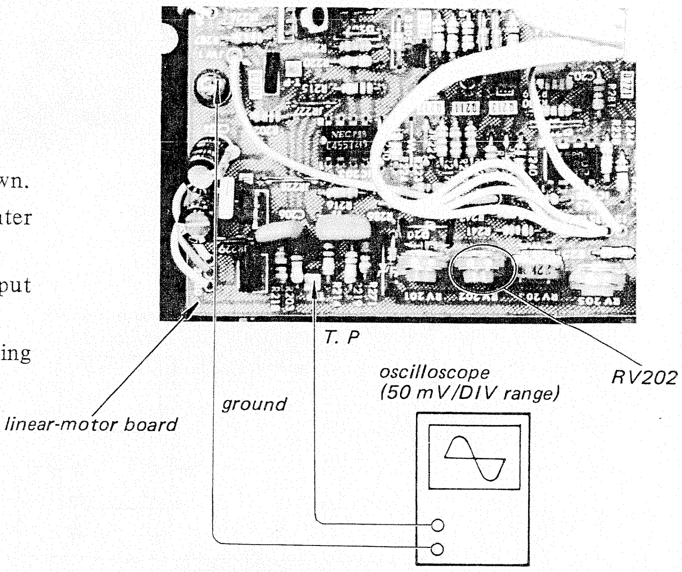
1. Put a blank record on the mat.
2. Set the SPEED to 33rpm.
3. Set the STYLUS FORCE to 3g.
4. Put the tonearm down on approximately the center of the recorded area (imaginary).
5. Adjust RV204 so that the tonearm does not skate.


linear-motor board
RV204

DOWN HORIZONTAL OFFSET ADJUSTMENT (2)

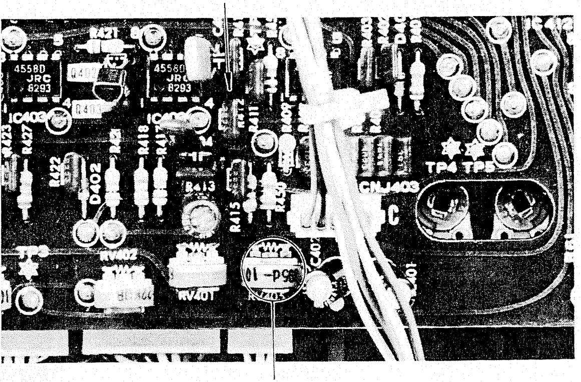
Note: Perform this adjustment after the inside force adjustment.

1. Put a record on the turntable mat.
2. Hold the turntable so that it does not move.
3. Connect an oscilloscope to the points as shown.
4. Move the tonearm by hand to the center of the recorded area.
5. Push the tonearm UP/DOWN button and put the tonearm on the record.
6. Adjust RV202 so that the voltage reading becomes 0V.


T. P
oscilloscope
(50 mV/DIV range)
RV202
ground
linear-motor board

LEAD-IN POSITION ADJUSTMENT

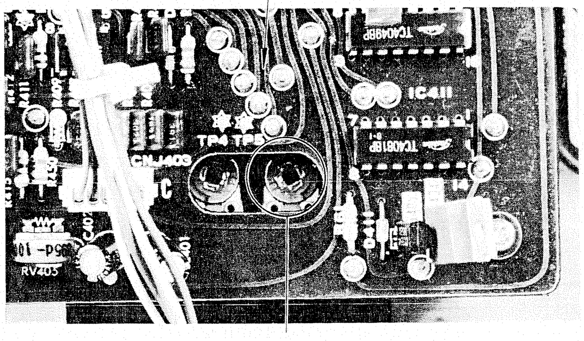
1. Put a test record YFSC-16 (SIDE A) on the turntable.
2. Adjust RV405 so that the stylus is led in the 8–13th count (voice announcement in Japanese) of the first landing-point test grooves when the AUTO PLAY button is pushed.


system-control board

RV405

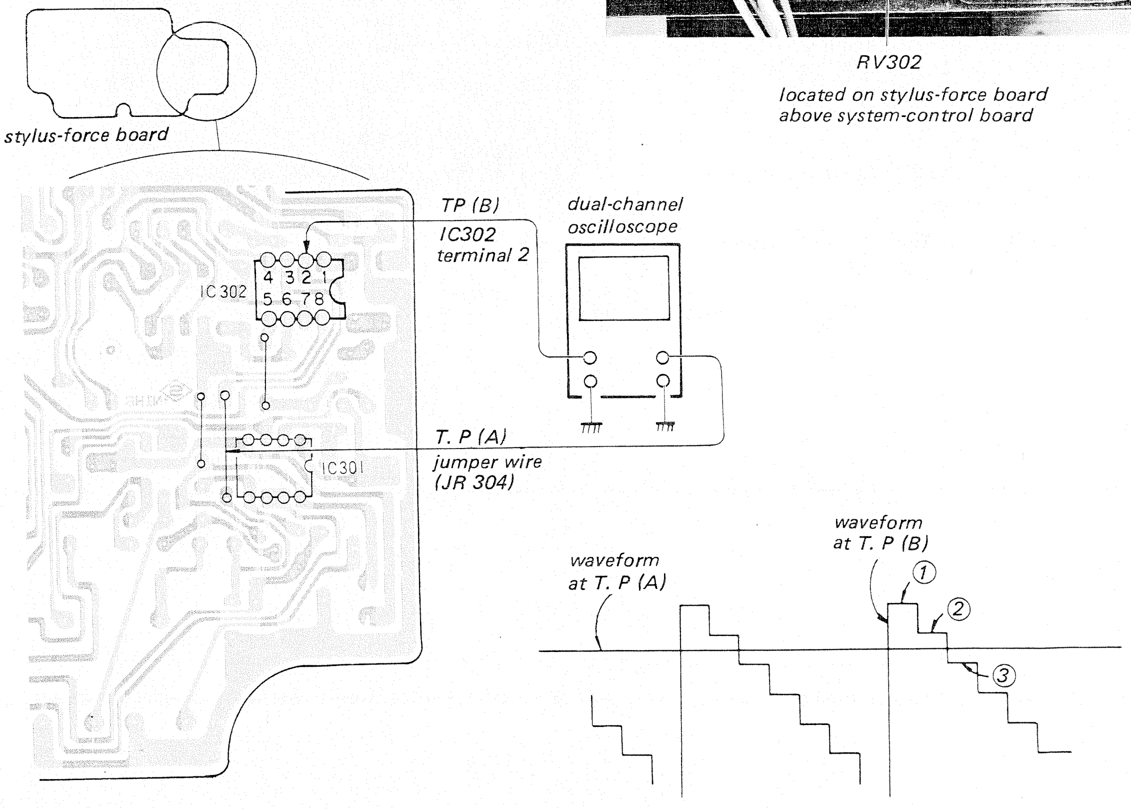
STYLUS FORCE ADJUSTMENT

1. Connect a dual-channel oscilloscope to the points as shown below.
2. Turn the STYLUS FORCE control to the full-clockwise stop "R".
3. Adjust RV302 so that the line-wise waveform at T. P (A) places in the midst of the second and third steps of the step waveform at T. P (B) as shown.


system-control board

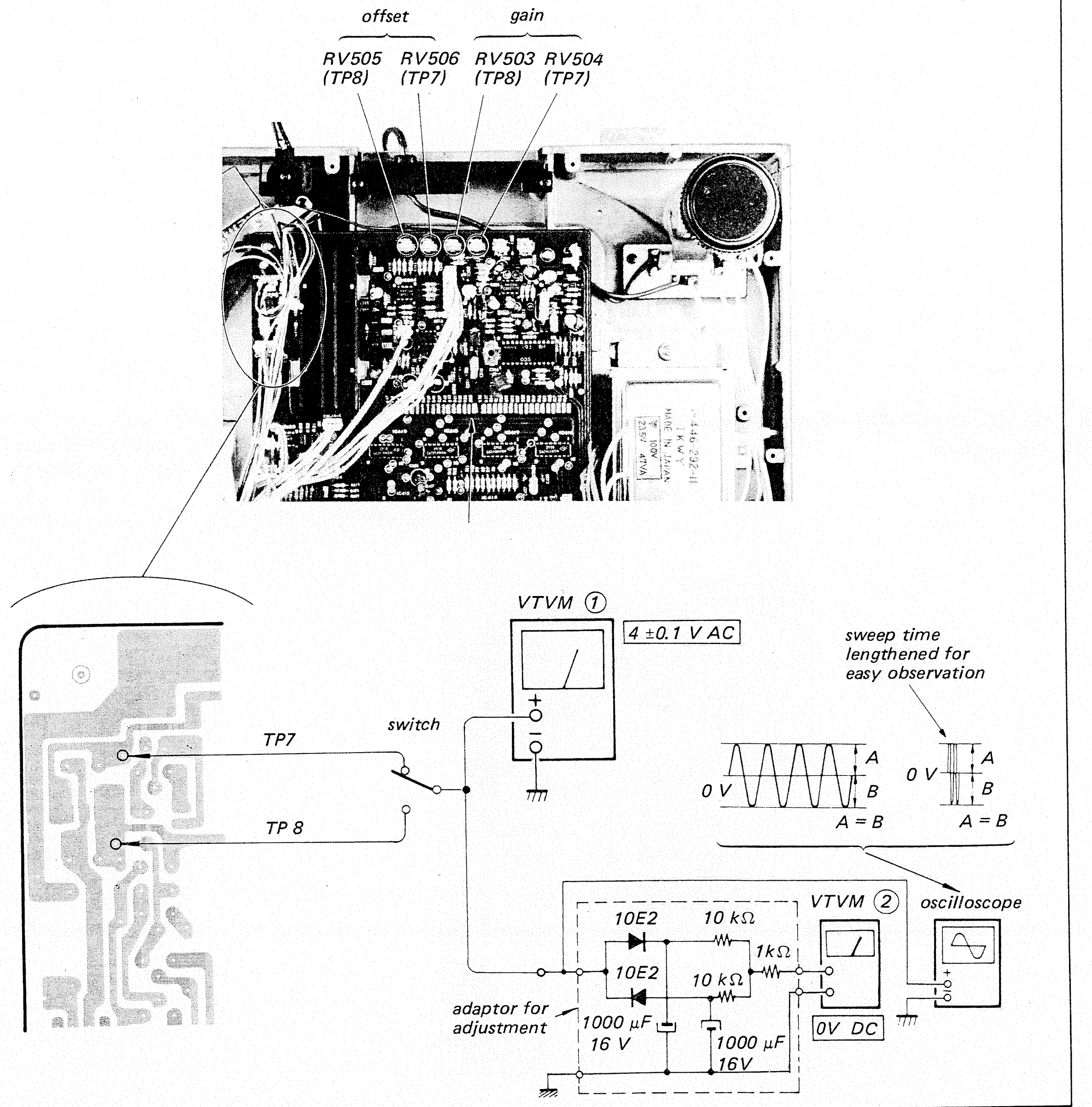
RV302

located on stylus-force board above system-control board


stylus-force board
IC302
4 3 2 1
5 6 7 8
IC301
TP (B)
IC302
terminal 2
dual-channel
oscilloscope
T. P (A)
jumper wire
(JR 304)
waveform
at T. P (B)
waveform
at T. P (A)
①
②
③

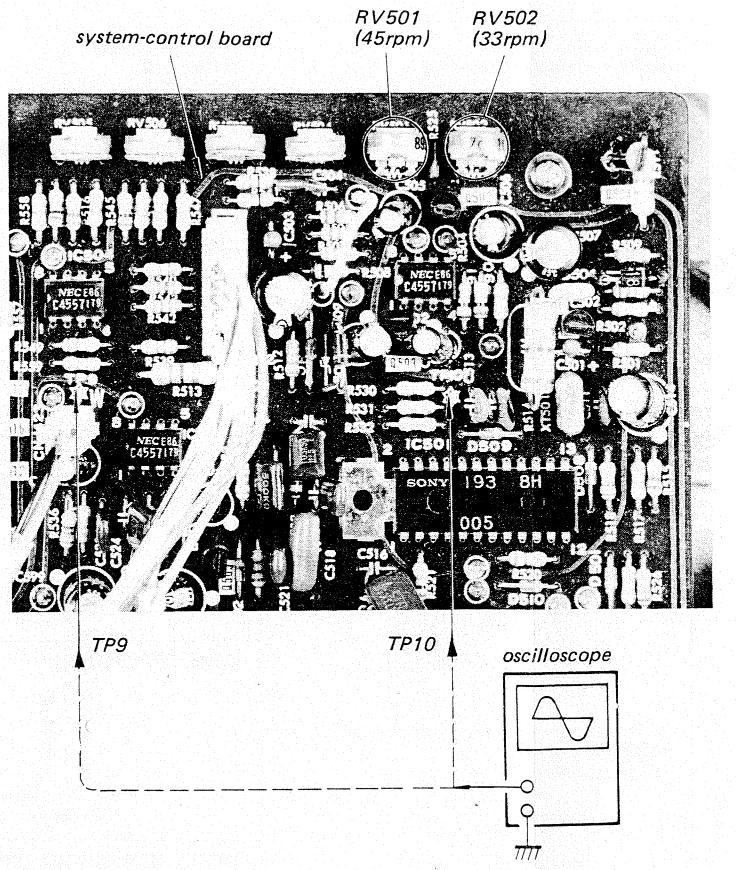
MAIN MOTOR ADJUSTMENT

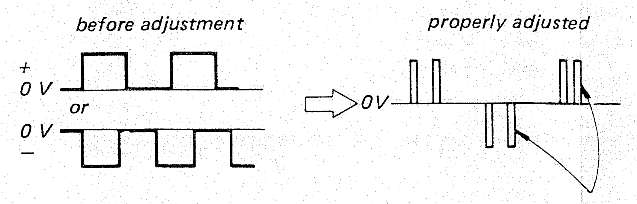
1. Make an adaptor for adjustment as sown below.
2. Connect VTVM ①, VTVM ② and an oscilloscope as shown.
3. Set the SPEED to 33.
4. Throw the switch to TP7 and adjust RV504 for a 4 ±0.1 V ac reading on the VTVM ① .
5. Throw the switch to TP8 and adjust RV503 for a 4 ±0.1 Vac reading on the VTVM ① .
6. Throw the switch to TP7 and adjust RV506 for a 0V dc reading on the VTVM ② or for a waveform as shown.
7. Throw the switch to TP8 and adjust RV505 for a 0V dc reading on the VTVM ② or for a waveform as shown.


offset
gain
RV505 (TP8)
RV506 (TP7)
RV503 (TP8)
RV504 (TP7)
VTVM ①
4 ±0.1 V AC
sweep time lengthened for easy observation
switch
TP7
TP 8
+
−
0 V
A
B
A = B
0 V
A
B
A = B
10E2
10 kΩ
1kΩ
10E2
10 kΩ
VTVM ②
oscilloscope
adaptor for adjustment
1000 µF 16 V
1000 µF 16V
0V DC

SPEED ADJUSTMENT

1. Set the SPEED to 33.
2. Connect an oscilloscope to TP9.
3. Push the START/STOP button and turn the turntable.
4. Confirm that the level of the waveform is 56 mVp-p – 140 mVp-p. When it excesses 140 mVp-p, confirm that the clearance between the coating on the inner wall of the turntable and speed-detection head is more than 0.3 mm.
5. Set the speed to 45.
6. Connect an oscilloscope to TP10.
7. Adjust RV501 for a waveform as shown below.
8. Set the speed to 33.
9. Adjust RV502 for a waveform as shown below.


system-control board
RV501 (45rpm)
RV502 (33rpm)
TP9
TP10
oscilloscope


before adjustment
properly adjusted
+
0 V
or
0 V
−
0V

Note: Positive-going and negative-going pulse pairs should appear alternately.

Repla
For re

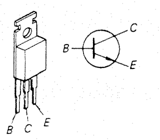
SECTION 4

DIAGRAMS

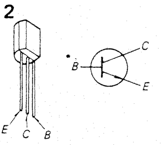
Replacement Semiconductors

For replacement, use semiconductors except in ( ).

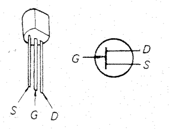
Q101, 404: 2SC1061 (2SC1419)
Q509, 515: 2SD476A



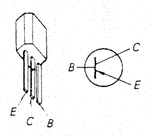
Q001, 002
Q102, 103
Q109, 110
Q401, 405
Q501, 502
Q505, 601
Q603, 611, 612
} :2SC1364



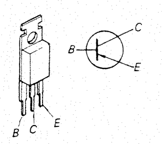
Q003,
Q104, 105
Q207, 208
Q210 ~ 222
Q402, 403
} : 2SK30A (2SK30)



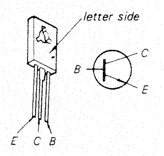
Q106, 107: 2SA1027R (2SA678)
Q503, 504, 506, 512: 2SA1027R (2SA844)



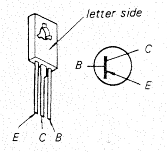
Q108: 2SA671 (2SA755)



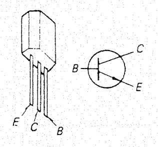
Q201, 205: 2SD414

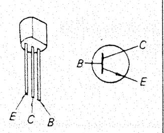

letter side
B
C
E
E
C
B

Q202, 204, 206: 2SB548

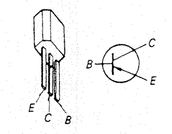

letter side
B
C
E
E
C
B

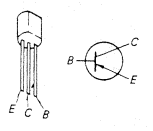
Q507, 508)
Q513, 514): 2SC926A (2SC1890)



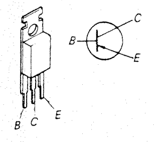


Q510, 516: 2SA1027R (2SA893)

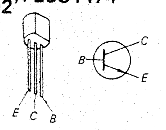


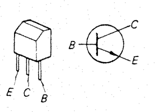


Q511, 517: 2SB566A

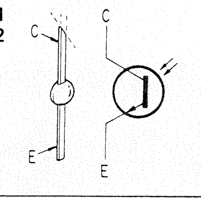


Q004)
Q602): 2SC1474 (2SD471)

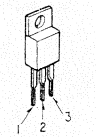




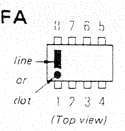
Q621 ~ 623: PH101
Q624 ~ 626: PH102



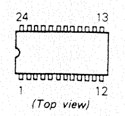
IC101: µPC14305H (µPC78M05)



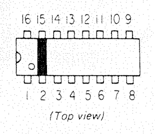
IC201 ~ 203, 404)
IC502 ~ 504): µPC4557C (µPC4557)
IC204 ~ 207, 209
IC301 ~ 304
IC401 ~ 403
IC405 ~ 410
IC422
} : µPC4558C (µPC4558)
IC208: NJM4558DFA


8 7 6 5
line
or
dot
1 2 3 4
(Top view)

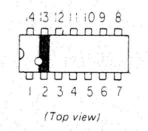
IC305: CX767
IC501: CX193


24
13
1
12
(Top view)

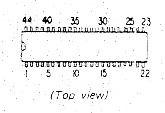
IC306, 412: µPD4049C (TC4049)
IC310)
IC416 ~ 421): TC4042BP (TC4042)
IC311: TC4520BP (TC4520)
IC312: TC4518BP (TC4518)
IC313, 314: TC4511BP (TC4511)
IC415: TC4028BP (TC4028)


16 15 14 13 12 11 10 9
1 2 3 4 5 6 7 8
(Top view)

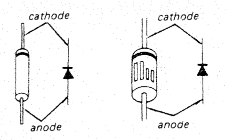
IC307: TC4073BP (TC4073)
IC308, 411: TC4081BP (TC4081)
IC309: TC4013BP (TC4013)
IC413: MSM4069


14 13 12 11 10 9 8
1 2 3 4 5 6 7
(Top view)

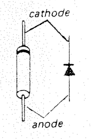
IC414: MB8841-125 (MB8841)


44 40 35 30 25 23
1 5 10 15 22
(Top view)

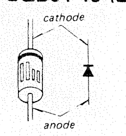
D101 ~ 108: 10E2 (SIB01-02)


cathode
anode
cathode
anode

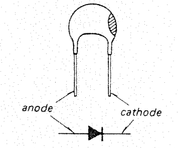
D001, 002, 008
D109, 110
D201, 202
D205 ~ 223
D302, 303, 305
D402, 404 ~ 410
D411, 412
D501 ~ 503
D508 ~ 510
D611, 612
} : 1S1555
D112, 113: HZ7B2L
D203, 204, 301)
D401, 403): HZ6B2L


cathode
anode

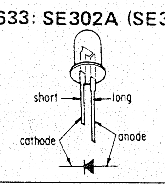
D304: EQB01-15 (EQA01-05)
D504, 505)
D003 ~ 007) EQB01-18 (EQA01-18R)


cathode
anode

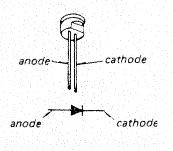
D506, 507: VD1221


anode
cathode

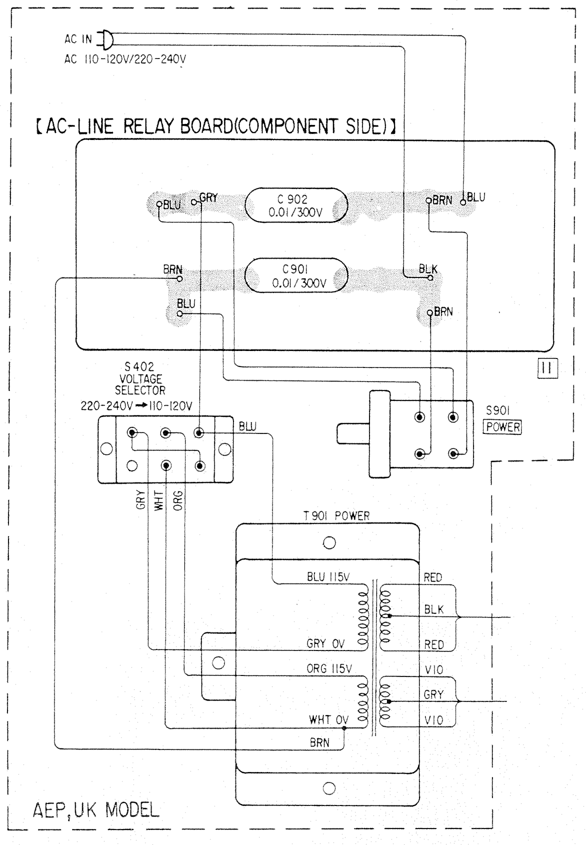
D631 ~ 633: SE302A (SE303A)


short
long
cathode
anode

D641 ~ 643)
D681 ~ 691): SLP24B

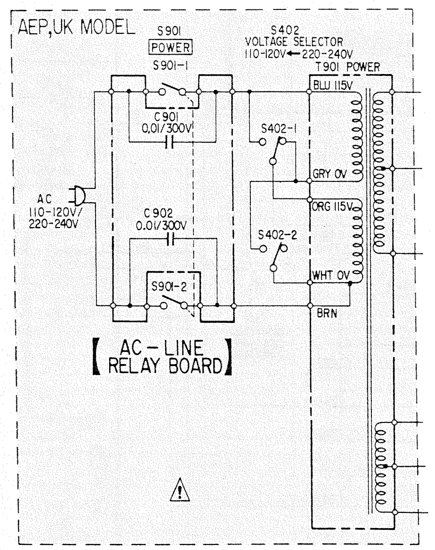

anode
cathode
anode
cathode

4-1. MOUNTING DIAGRAM — Power Supply Section — (AEP, UK models)


AC IN
AC 110-120V/220-240V
[AC-LINE RELAY BOARD(COMPONENT SIDE)]
BLU
GRY
C 902
0.01/300V
BRN
BLU
BRN
C901
0.01/300V
BLK
BLU
BRN
S402
VOLTAGE
SELECTOR
220-240V → 110-120V
BLU
S901
POWER
GRY
WHT
ORG
T901 POWER
BLU 115V
GRY 0V
ORG 115V
WHT 0V
BRN
RED
BLK
RED
VIO
GRY
VIO
AEP, UK MODEL

4-2. SCHEMATIC DIAGRAM — Power Supply Section — (AEP, UK models)

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

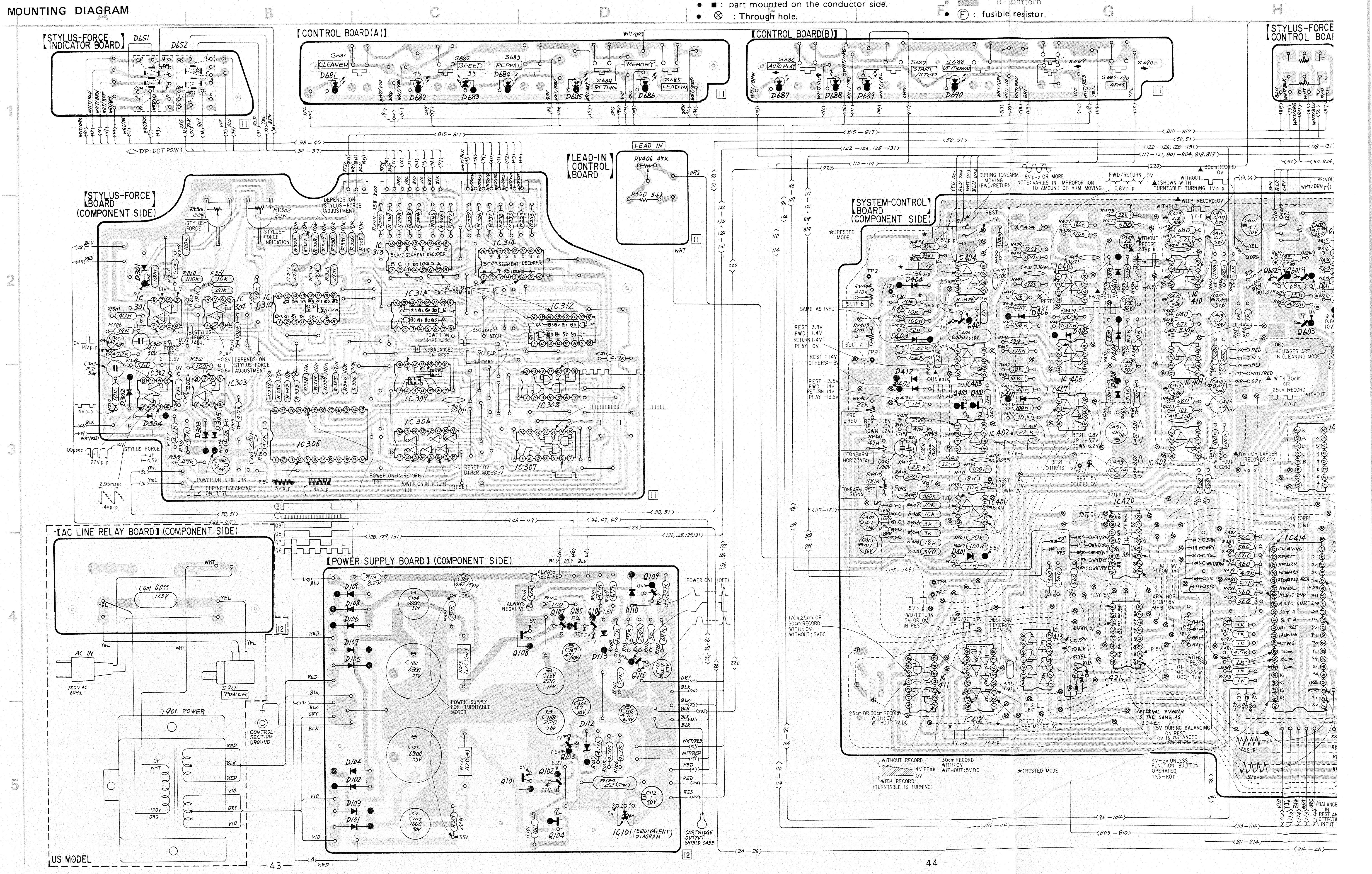

AEP, UK MODEL
S901
POWER
S901-1
S402
VOLTAGE SELECTOR
110-120V ← 220-240V
T901 POWER
BLU 115V
C901
0.01/300V
S402-1
GRY 0V
AC
110-120V/
220-240V
C902
0.01/300V
ORG 115V
S402-2
S901-2
WHT 0V
BRN
AC-LINE RELAY BOARD
⚠

PS-B80 PS-B80

4-3. MOUNTING DIAGRAM

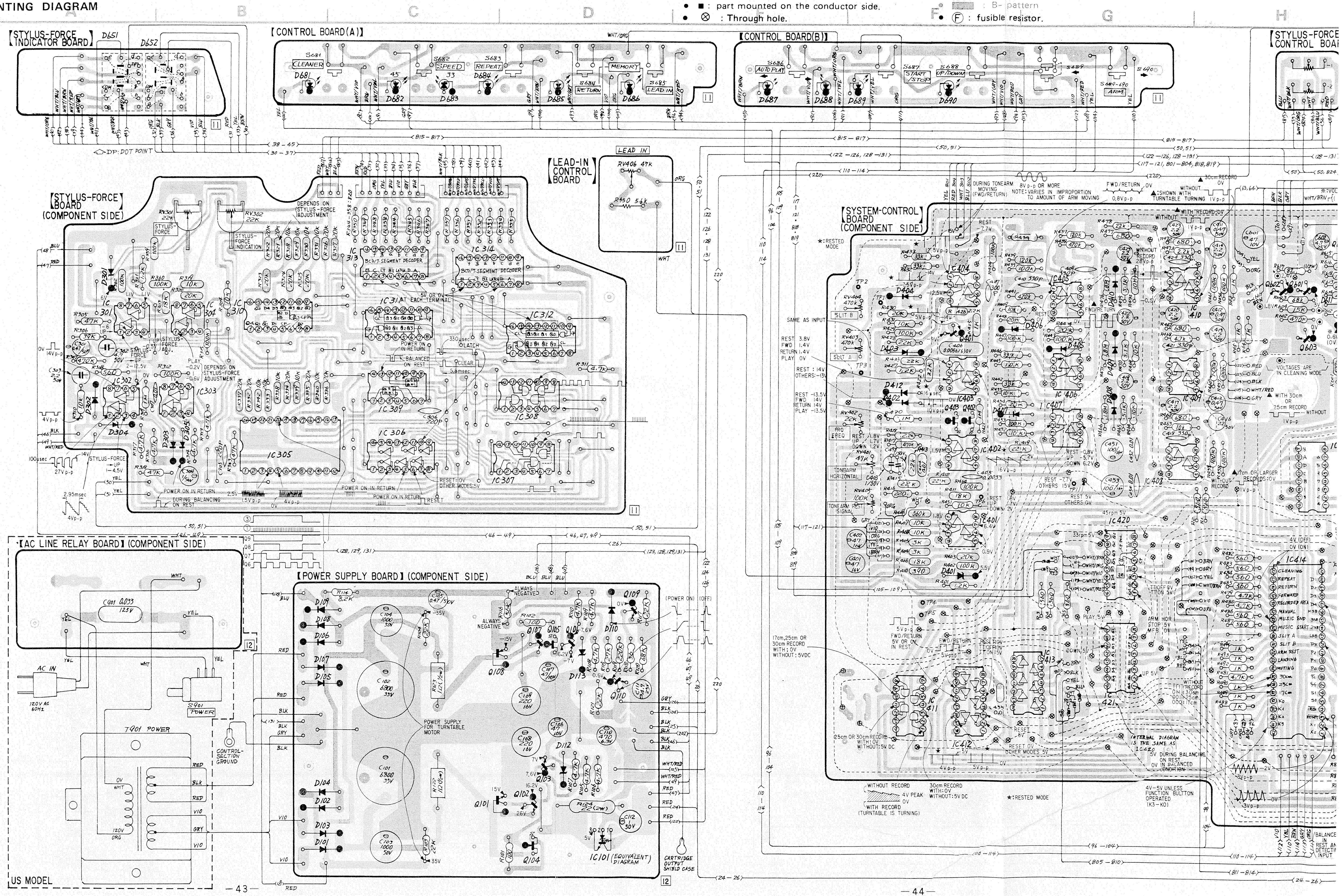
Note:

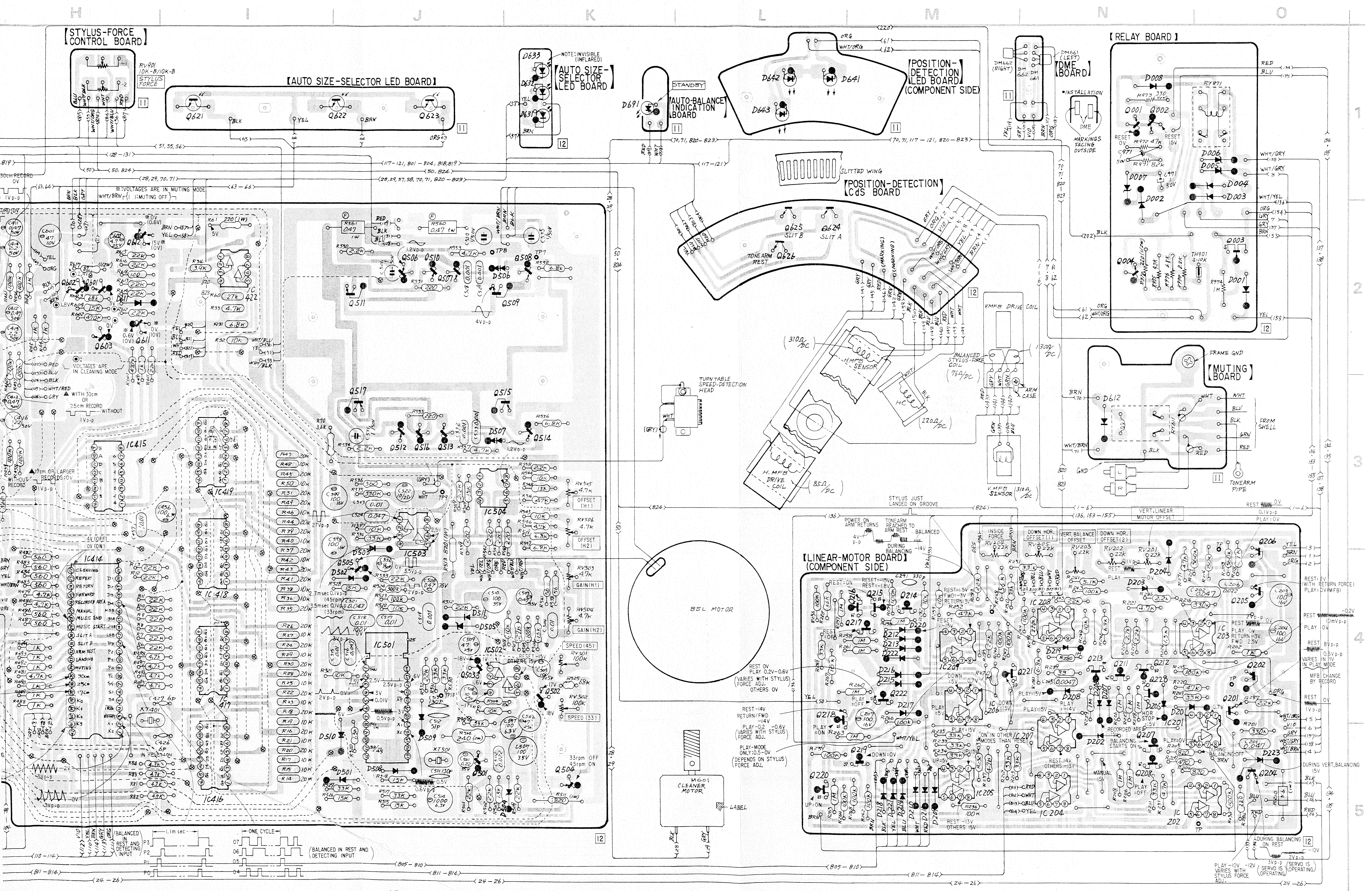
- ○—: parts extracted from the component side.
- ●—: parts extracted from the conductor side.
- ■: part mounted on the conductor side.
- ⊗: Through hole.
- ⊗--⊗: component-side pattern.
- ▨: B+ pattern
- ▨: B- pattern
- Ⓕ: fusible resistor.


A
B
C
D
E
F
G
H
1
2
3
4
5
【STYLUS-FORCE INDICATOR BOARD】
D651
D652
【CONTROL BOARD(A)】
S681 CLEANER
S682 SPEED
S683 REPEAT
S684 RETURN
S685 LEAD IN
MEMORY
D681
D682
D683
D684
D685
D686
【CONTROL BOARD(B)】
S686 AUTO PLAY
S687 START/STOP
S688 UP/DOWN
S689
S690
S689-690 ARM
D687
D688
D689
D690
【STYLUS-FORCE CONTROL BOARD】
DP: DOT POINT
【LEAD-IN CONTROL BOARD】
LEAD IN
RV406 47k
R430 5.6k
【STYLUS-FORCE BOARD (COMPONENT SIDE)】
RV301 22K
RV302 22K
STYLUS-FORCE
STYLUS-FORCE INDICATION
DEPENDS ON STYLUS-FORCE ADJUSTMENT
IC301
IC302
IC303
IC304
IC305
IC306
IC307
IC308
IC309
IC310
IC311
IC312
IC313
IC314
BCD/7 SEGMENT DECODER
5V OR 0V AT EACH TERMINAL
POWER ON IN RETURN
BALANCED ON REST
LATCH
CLEAR
330μsec
3.8msec
DURING BALANCING ON REST
RESET: 0V OTHER MODES: 5V
【SYSTEM-CONTROL BOARD (COMPONENT SIDE)】
★: RESTED MODE
DURING TONEARM MOVING (FWD/RETURN)
8V p-p OR MORE
NOTE: VARIES IN IMPROPORTION TO AMOUNT OF ARM MOVING
FWD/RETURN 0V 0.8V p-p
▲: SHOWN WITH TURNTABLE TURNING
WITHOUT 30cm RECORD 0V
WITH RECORD 0V
SAME AS INPUT
REST 3.8V FWD 1.4V RETURN 1.4V PLAY 0V
TONEARM HORIZONTAL
TONEARM REST SIGNAL
IC401
IC402
IC403
IC404
IC405
IC406
IC407
IC408
IC409
IC410
IC411
IC412
IC413
IC414
IC420
IC421
VOLTAGES ARE IN CLEANING MODE
WITH 30cm OR 25cm RECORD
17cm OR LARGER RECORDS: 0V
INTERNAL DIAGRAM IS THE SAME AS IC420
5V DURING BALANCING ON REST 0V IN BALANCED CONDITION
4V-5V UNLESS FUNCTION BUTTON OPERATED (K3-K0)
WITHOUT RECORD
WITH RECORD (TURNTABLE IS TURNING)
30cm RECORD WITH: 0V WITHOUT: 5V DC
CLEANING
REPEAT
RETURN
FORWARD
RECORDED AREA
MANUAL
MUSIC END
MUSIC START
SLIT B
ARM REST
LADING
MUTING
【AC LINE RELAY BOARD】(COMPONENT SIDE)
C901 0.033 125V
AC IN
120V AC 60Hz
S901 POWER
T901 POWER
US MODEL
CONTROL-SECTION GROUND
【POWER SUPPLY BOARD】(COMPONENT SIDE)
D101
D102
D103
D104
D105
D106
D107
D108
D109
D110
D112
D113
Q101
Q102
Q103
Q104
Q107
Q108
Q109
Q110
C101 6800 35V
C102 6800 35V
C103 1000 50V
C104 1000 50V
POWER SUPPLY FOR TURNTABLE MOTOR
ALWAYS NEGATIVE
(POWER ON) (OFF)
IC101 (EQUIVALENT DIAGRAM)
CARTRIDGE OUTPUT SHIELD CASE

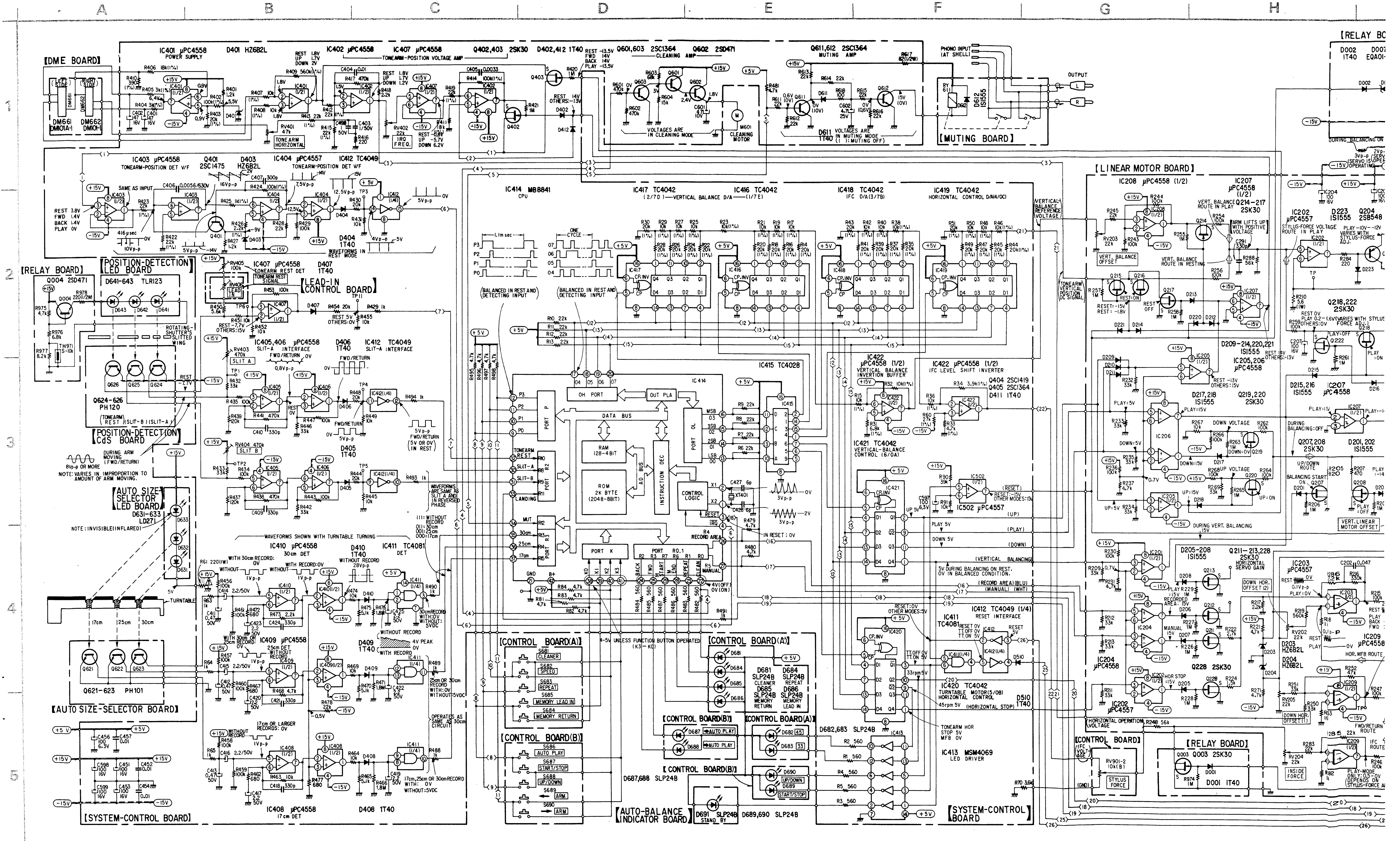
Note:
- ○—: parts extracted from the component side.
- ●—: parts extracted from the conductor side.
- ■ : part mounted on the conductor side.
- ⊗ : Through hole.
- ●⊗--⊗ : component-side pattern.
- ▨ : B+ pattern
- ▨ : B- pattern
- Ⓕ : fusible resistor.

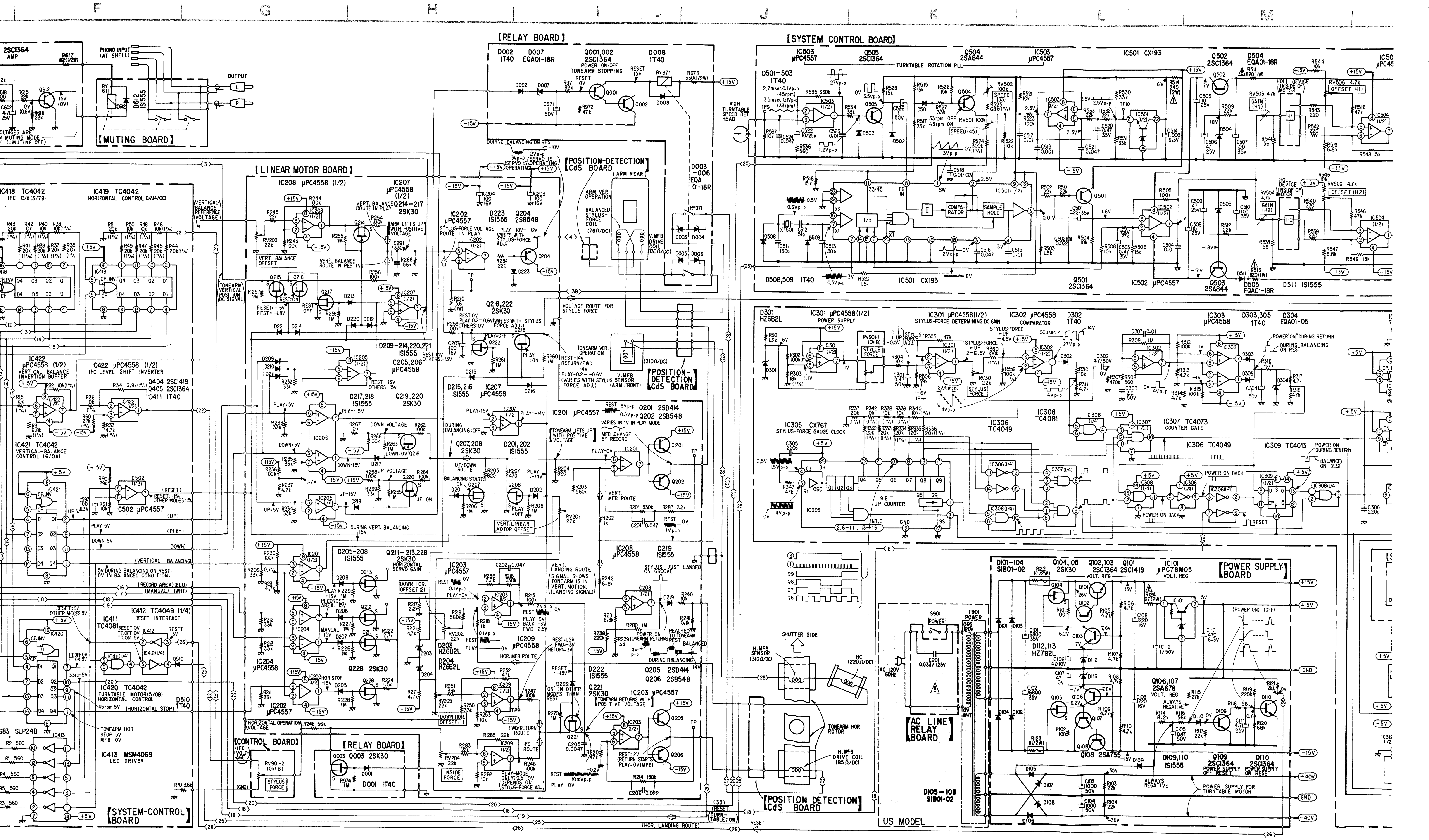
4-3. MOUNTING DIAGRAM

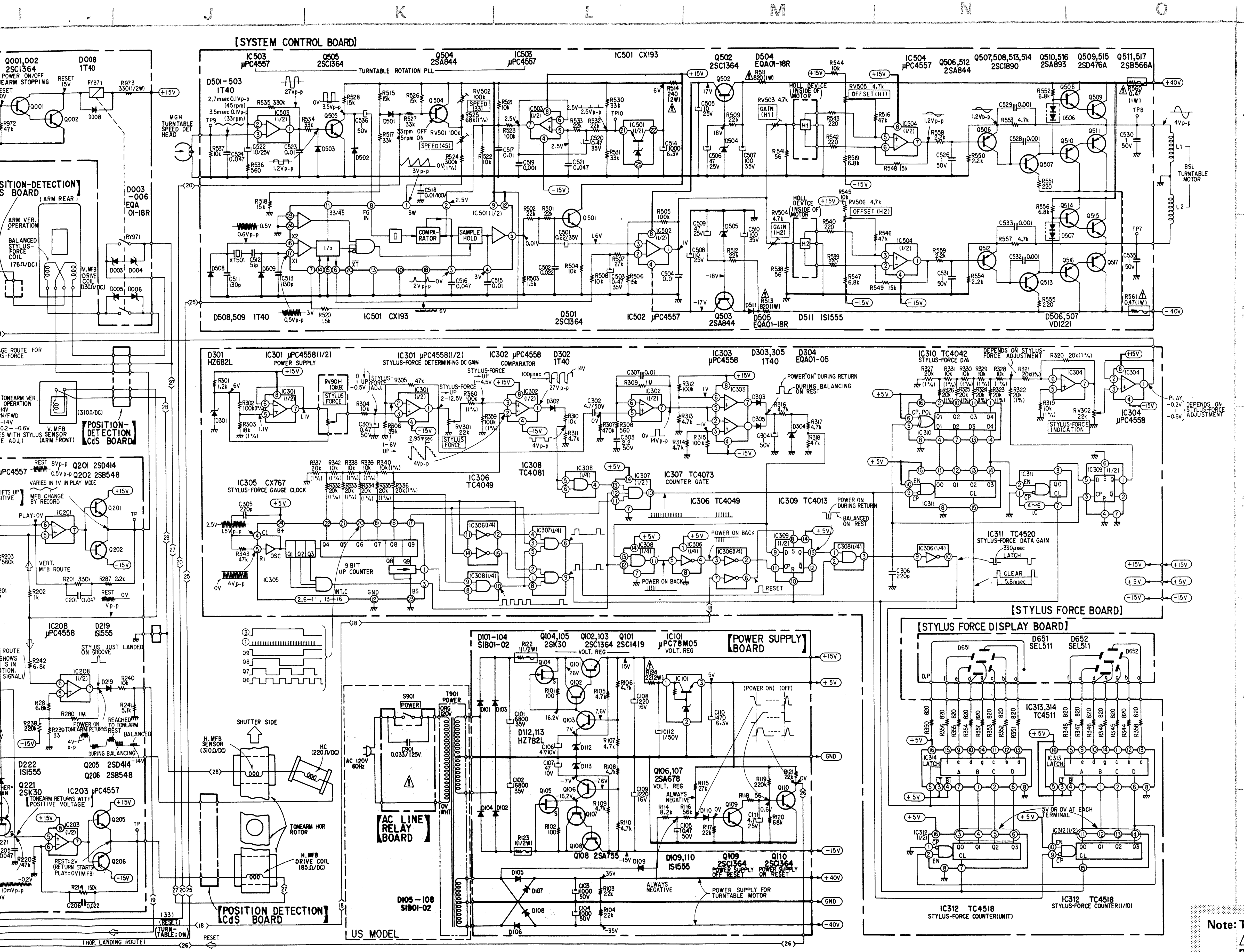

A
B
C
D
E
F
G
H
1
2
3
4
5
【STYLUS-FORCE INDICATOR BOARD】
D651
D652
【CONTROL BOARD(A)】
S681 CLEANER
S682 SPEED
S683 REPEAT
S684 RETURN
S685 LEAD IN
MEMORY
D681
D682
D683
D684
D685
D686
【CONTROL BOARD(B)】
S686 AUTO PLAY
S687 START/STOP
S688 UP/DOWN
S689-690 ARM
S690
D687
D688
D689
D690
【STYLUS-FORCE CONTROL BOAR
DP: DOT POINT
【LEAD-IN CONTROL BOARD】
LEAD IN
RV406 47k
R450 5.6k
【STYLUS-FORCE BOARD (COMPONENT SIDE)】
RV301 22K
RV302 22K
STYLUS-FORCE
STYLUS-FORCE INDICATION
DEPENDS ON STYLUS-FORCE ADJUSTMENT
IC313
IC314
BCD/7 SEGMENT DECODER
IC301
IC302
IC303
IC304
IC305
IC306
IC307
IC308
IC309
IC310
IC311
IC312
D301
D302
D303
D304
D305
POWER ON IN RETURN
BALANCED ON REST
DURING BALANCING ON REST
RESET: 0V OTHER MODES: 5V
330μsec LATCH
CLEAR 5.8msec
【SYSTEM-CONTROL BOARD (COMPONENT SIDE)】
★: RESTED MODE
DURING TONEARM MOVING (FWD/RETURN)
8Vp-p OR MORE
NOTE: VARIES IN IMPROPORTION TO AMOUNT OF ARM MOVING
FWD/RETURN 0.8Vp-p
▲: SHOWN WITH TURNTABLE TURNING 1Vp-p
WITHOUT RECORD 0V
IC401
IC402
IC403
IC404
IC405
IC406
IC407
IC408
IC409
IC410
IC411
IC412
IC413
IC414
IC420
IC421
Q401
Q402
Q403
Q601
Q602
Q603
TONEARM HORIZONTAL
TONEARM POST SIGNAL
SAME AS INPUT
REST 3.8V FWD 1.4V RETURN 1.4V PLAY 0V
REST: 14V OTHERS: -13V
REST -13.5V FWD 14V RETURN 14V PLAY -13.5V
VOLTAGES ARE IN CLEANING MODE
17cm, 25cm OR 30cm RECORD WITH: 0V WITHOUT: 5VDC
25cm OR 30cm RECORD WITH: 0V WITHOUT: 5V DC
WITHOUT RECORD
WITH RECORD (TURNTABLE IS TURNING)
30cm RECORD WITH: 0V WITHOUT: 5V DC
INTERNAL DIAGRAM IS THE SAME AS IC420
5V DURING BALANCING ON REST 0V IN BALANCED
4V-5V UNLESS FUNCTION BUTTON OPERATED (K3-K0)
CLEANING
REPEAT
RETURN
FORWARD
MANUAL
MUSIC END
MUSIC START
SLIT A
SLIT B
ARM REST
LANDING
MUTING
30cm
25cm
17cm
【AC LINE RELAY BOARD】(COMPONENT SIDE)
C901 0.033 125V
AC IN
120V AC 60Hz
S901 POWER
T901 POWER
CONTROL-SECTION GROUND
US MODEL
【POWER SUPPLY BOARD】(COMPONENT SIDE)
ALWAYS NEGATIVE
D101
D102
D103
D104
D105
D106
D107
D108
D109
D110
D112
D113
Q101
Q102
Q103
Q104
Q105
Q106
Q107
Q108
Q109
Q110
C101 6800 35V
C102 6800 35V
C103 1000 50V
C104 1000 50V
POWER SUPPLY FOR TURNTABLE MOTOR
R124 22 (2W)
IC101 (EQUIVALENT DIAGRAM)
(POWER ON) (OFF)
CARTRIDGE OUTPUT SHIELD CASE


H
I
J
K
L
M
N
O
1
2
3
4
5
【STYLUS-FORCE CONTROL BOARD】
RV901 10K-B/10K-B STYLUS FORCE
【AUTO SIZE-SELECTOR LED BOARD】
Q621
Q622
Q623
NOTE: INVISIBLE (INFLARED)
【AUTO SIZE-SELECTOR LED BOARD】
D633
D632
D631
STANDBY
D691
【AUTO-BALANCE INDICATION BOARD】
【POSITION-DETECTION LED BOARD】 (COMPONENT SIDE)
D642
D641
D643
DM662 (RIGHT)
DM661 (LEFT)
【DME BOARD】
•INSTALLATION
DME
MARKINGS FACING OUTSIDE
【RELAY BOARD】
RY971
D008
Q001
Q002
D006
D005
D004
D003
D007
D002
Q003
Q004
TH901 S-10K
D001
SLITTED WING
【POSITION-DETECTION CdS BOARD】
Q625 SLIT B
Q624 SLIT A
TONEARM REST
Q626
VMFB DRIVE COIL
H.MFB SENSOR
BALANCED STYLUS-FORCE COIL
ARM CASE
HC
H.MFB DRIVE COIL
V.MFB SENSOR
TURNTABLE SPEED-DETECTION HEAD
FRAME GND
【MUTING BOARD】
D612
RY612
FROM SHELL
TONEARM PIPE
※:VOLTAGES ARE IN MUTING MODE
VOLTAGES ARE IN CLEANING MODE
▲ WITH 30cm OR 25cm RECORD WITHOUT
▲17cm OR LARGER RECORDS: 0V WITHOUT RECORD
IC415
IC414
IC419
IC418
IC417
IC416
IC422
IC501
IC502
IC503
IC504
Q501
Q502
Q503
Q504
Q505
Q506
Q507
Q508
Q509
Q510
Q511
Q512
Q513
Q514
Q515
Q516
Q517
Q601
Q602
Q603
Q611
Q612
D501
D502
D503
D505
D506
D507
D508
D509
D510
D511
CLEANING
REPEAT
RETURN
FORWARD
RECORDED AREA
MANUAL
MUSIC END
MUSIC START
SLIT A
SLIT B
ARM REST
LANDING
MUTING
30cm
25cm
17cm
BALANCED IN REST AND DETECTING INPUT
1.1m sec
ONE CYCLE
(BALANCED IN REST AND DETECTING INPUT)
OFFSET (H1)
OFFSET (H2)
GAIN (H1)
GAIN (H2)
SPEED (45)
SPEED (33)
RV505 4.7k
RV506 4.7k
RV503 4.7k
RV504 4.7k
RV501 100k
RV502 100k
33rpm OFF 45rpm ON
BSL MOTOR
M601 CLEANER MOTOR
LABEL
STYLUS JUST LANDED ON GROOVE
POWER ON ARM RETURNS
TONEARM REACHED TO ARM REST
BALANCED
DURING BALANCING
【LINEAR-MOTOR BOARD】 (COMPONENT SIDE)
INSIDE FORCE
DOWN HOR. OFFSET(1)
VERT. BALANCE OFFSET
DOWN HOR. OFFSET(2)
VERT. LINEAR MOTOR OFFSET
RV206
RV205
RV203
RV202
RV201
IC201
IC202
IC203
IC204
IC205
IC206
IC207
IC208
Q201
Q202
Q204
Q205
Q206
Q207
Q208
Q211
Q212
Q213
Q214
Q215
Q216
Q217
Q218
Q219
Q220
Q221
Q222
D201
D202
D203
D204
D205
D207
D208
D209
D210
D211
D212
D213
D214
D215
D216
D217
D218
D219
D220
D221
D222
D223
REST: 2V (WITH RETURN FORCE) PLAY: 0V (MFB)
REST 0V PLAY: 0.2V-0.6V (VARIES WITH STYLUS FORCE ADJ. OTHERS 0V
REST -14V RETURN/FWD -14V PLAY-0.2 -0.6V (VARIES WITH STYLUS FORCE ADJ.
PLAY-MODE ONLY: 0.5-0V (DEPENDS ON STYLUS FORCE ADJ.
ON IN OTHER MODES THAN REST
REST 14V OTHERS -13V
REST -13V OTHERS 15V
BALANCING STARTS ON
RECORDED AREA
DURING BALANCING: OFF
DURING VERT. BALANCING 15V
MFB CHANGE BY RECORD
DURING BALANCING ON REST
PLAY -10V VARIES WITH STYLUS FORCE ADJ.
(SERVO IS OPERATING)
-12V (SERVO IS OPERATING)

4-4. SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
【DME BOARD】
DM661 DM662
DM101A-1 DM101-1
IC401 μPC4558 POWER SUPPLY
D401 HZ6B2L
IC402 μPC4558
IC407 μPC4558
TONEARM-POSITION VOLTAGE AMP
Q402,403 2SK30
D402,412 1T40
Q601,603 2SC1364
Q602 2SD471
CLEANING AMP
VOLTAGES ARE IN CLEANING MODE
M601 CLEANING MOTOR
Q611,612 2SC1364 MUTING AMP
D611 1T40
VOLTAGES ARE IN MUTING MODE ( ):MUTING OFF)
PHONO INPUT (AT SHELL)
OUTPUT
L
R
【MUTING BOARD】
【RELAY BOARD】
D002 1T40
D007 EQA01-
DURING BALANCING ON
IC403 μPC4558 TONEARM-POSITION DET V/F
Q401 2SC1475
D403 HZ6B2L
IC404 μPC4557 TONEARM-POSITION DET V/F
IC412 TC4049
REST 3.8V FWD 1.4V BACK 1.4V PLAY 0V
TONE ARM HORIZONTAL
WAVEFORMS IN REST MODE
【LINEAR MOTOR BOARD】
IC208 μPC4558 (1/2)
IC207 μPC4558 (1/2)
Q214~217 2SK30
IC202 μPC4557
D223 IS1555
Q204 2SB548
STYLUS-FORCE VOLTAGE ROUTE IN PLAY
VERT. BALANCE OFFSET
VERT. BALANCE ROUTE IN RESTING
ARM LIFTS UP WITH POSITIVE VOLTAGE
Q218,222 2SK30
D209~214,220,221 IS1555
IC205,206 μPC4558
D217,218 IS1555
Q219,220 2SK30
D215,216 IS1555
IC207 μPC4558
Q207,208 2SK30
D201,202 IS1555
VERT. LINEAR MOTOR OFFSET
【RELAY BOARD】
Q004 2SD471
D641~643 TLR123
【POSITION-DETECTION LED BOARD】
ROTATING-SHUTTER'S SLITTED WING
Q624~626 PH120
【POSITION-DETECTION CdS BOARD】
IC407 μPC4558 TONEARM REST DET
D407 1T40
【LEAD-IN CONTROL BOARD】
IC405,406 μPC4558 SLIT-A INTERFACE
D406 1T40
IC412 TC4049 SLIT-A INTERFACE
FWD/RETURN
D405 1T40
DURING ARM MOVING (FWD/RETURN)
8Vp-p OR MORE
NOTE: VARIES IN IMPROPORTION TO AMOUNT OF ARM MOVING.
【AUTO SIZE-SELECTOR LED BOARD】
D631~633 LD271
NOTE: INVISIBLE (INFLARED)
TURNTABLE
17cm 25cm 30cm
Q621~623 PH101
【AUTO SIZE-SELECTOR BOARD】
WAVEFORMS SHOWN WITH TURNTABLE TURNING
IC410 μPC4558 30cm DET
D410 1T40
IC411 TC4081 DET
IC409 μPC4558 25cm DET
D409 1T40
IC408 μPC4558 17cm DET
D408 1T40
OPERATES AS SAME AS 30cm CIRCUIT
WAVEFORMS ARE SAME AS SLIT A AND IN REVERSED PHASE
【SYSTEM-CONTROL BOARD】
IC414 MB8841 CPU
OH PORT
OUT PLA
DATA BUS
RAM 128-4BIT
ROM 2K BYTE (2048-8BIT)
INSTRUCTION DEC
CONTROL LOGIC
PORT K
PORT RO.1
(BALANCED IN REST AND) (DETECTING INPUT
IC417 TC4042 (2/7D)—VERTICAL BALANCE D/A—(1/7E)
IC416 TC4042
IC418 TC4042 IFC D/A(3/7B)
IC419 TC4042 HORIZONTAL CONTROL D/A(4/OC)
VERTICAL BALANCE REFERENCE VOLTAGE
TONEARM VERTICAL POSITION DC SIGNAL
IC415 TC4028
IC422 μPC4558 (1/2) VERTICAL BALANCE INVERTION BUFFER
IC422 μPC4558 (1/2) IFC LEVEL SHIFT INVERTER
Q404 2SC1419
Q405 2SC1364
D411 1T40
IC421 TC4042 VERTICAL-BALANCE CONTROL (6/0A)
IC502 μPC4557
IC411 TC4081
IC412 TC4049 (1/4) RESET INTERFACE
IC420 TC4042 TURNTABLE MOTOR(5/0B) HORIZONTAL CONTROL
D510 1T40
IC413 MSM4069 LED DRIVER
5V DURING BALANCING ON REST. 0V IN BALANCED CONDITION.
4-5V UNLESS FUNCTION BUTTON OPERATED (K3~K0)
【CONTROL BOARD(A)】
S681 CLEANER
S682 SPEED
S683 REPEAT
S685 MEMORY LEAD IN
S684 MEMORY RETURN
【CONTROL BOARD(B)】
S686 AUTO PLAY
S687 START/STOP
S688 UP/DOWN
S689 ARM
S690 ARM
D681 SLP24B CLEANER
D684 SLP24B REPEAT
D685 SLP24B MEMORY RETURN
D686 SLP24B MEMORY LEAD IN
D682,683 SLP24B
D687,688 SLP24B
D689,690 SLP24B
D691 SLP24B STAND BY
【AUTO-BALANCE INDICATOR BOARD】
【SYSTEM-CONTROL BOARD】
IC203 μPC4557
IC209 μPC4558
D205~208 IS1555
Q211~213,228 2SK30 HORIZONTAL SERVO GAIN
IC204 μPC4558
IC202 μPC4557
D203 HZ6B2L
D204 HZ6B2L
Q228 2SK30
HORIZONTAL OPERATION VOLTAGE
【CONTROL BOARD】
RV901-2 10k(B)
STYLUS FORCE
【RELAY BOARD】
Q003 2SK30
D001 1T40
INSIDE FORCE
PLAY-MODE ONLY: 0.5~0V (DEPENDS ON STYLUS-FORCE ADJ.)


F
G
H
I
J
K
L
M
[RELAY BOARD]
[SYSTEM CONTROL BOARD]
[MUTING BOARD]
[LINEAR MOTOR BOARD]
[POSITION-DETECTION CdS BOARD]
(ARM REAR)
[POSITION-DETECTION CdS BOARD]
(ARM FRONT)
[POWER SUPPLY BOARD]
[AC LINE RELAY BOARD]
[CONTROL BOARD]
[RELAY BOARD]
[SYSTEM-CONTROL BOARD]
[POSITION DETECTION CdS BOARD]
US MODEL
PHONO INPUT (AT SHELL)
OUTPUT
L
R
2SC1364 AMP
IC418 TC4042 IFC D/A(3/7B)
IC419 TC4042 HORIZONTAL CONTROL D/A(4/0C)
IC422 μPC4558 (1/2) VERTICAL BALANCE INVERTION BUFFER
IC422 μPC4558 (1/2) IFC LEVEL SHIFT INVERTER
Q404 2SC1419
Q405 2SC1364
D411 1T40
IC421 TC4042 VERTICAL-BALANCE CONTROL (6/0A)
IC502 μPC4557
IC411 TC4081
IC412 TC4049 (1/4) RESET INTERFACE
IC420 TC4042 TURNTABLE MOTOR(5/0B) HORIZONTAL CONTROL
IC413 MSM4069 LED DRIVER
583 SLP24B
TONEARM HOR STOP 5V MFB 0V
D510 1T40
IC208 μPC4558 (1/2)
IC207 μPC4558 (1/2)
Q214-217 2SK30
IC202 μPC4557
D223 1S1555
Q204 2SB548
Q218, 222 2SK30
D209-214,220,221 1S1555
IC205,206 μPC4558
D217,218 1S1555
Q219,220 2SK30
D215,216 1S1555
IC207 μPC4558
Q207,208 2SK30
D201,202 1S1555
IC201 μPC4557
Q201 2SD414
Q202 2SB548
D205-208 1S1555
Q211-213,228 2SK30
IC203 μPC4557
IC209 μPC4558
D203 HZ6B2L
D204 HZ6B2L
Q228 2SK30
IC204 μPC4558
IC202 μPC4557
IC208 μPC4558
D219 1S1555
D222 1S1555
Q221 2SK30
Q205 2SD414
Q206 2SB548
IC203 μPC4557
Q003 2SK30
D001 1T40
D002 D007 1T40 EQA01-18R
Q001,002 2SC1364 POWER ON/OFF TONEARM STOPPING
D008 1T40
D003-006 EQA 01-18R
V.MFB DRIVE COIL (130Ω/DC)
V.MFB (ARM FRONT)
TONEARM VER. OPERATION
IC503 μPC4557
Q505 2SC1364
Q504 2SA844
IC503 μPC4557
IC501 CX193
Q502 2SC1364
D504 EQA01-18R
TURNTABLE ROTATION PLL
MGH TURNTABLE SPEED DET HEAD
D501-503 1T40
D508,509 1T40
IC501 CX193
Q501 2SC1364
IC502 μPC4557
Q503 2SA844
D505 EQA01-18R
D511 1S1555
HOLL DEVICE (INSIDE OF MOTOR)
D301 HZ6B2L
IC301 μPC4558(1/2) POWER SUPPLY
IC301 μPC4558(1/2) STYLUS-FORCE DETERMINING DC GAIN
IC302 μPC4558 COMPARATOR
D302 1T40
IC303 μPC4558
D303,305 1T40
D304 EQA01-05
IC305 CX767 STYLUS-FORCE GAUGE CLOCK
IC306 TC4049
IC308 TC4081
IC307 TC4073 COUNTER GATE
IC306 TC4049
IC309 TC4013
9 BIT UP COUNTER
D101-104 S1B01-02
Q104,105 2SK30
Q102,103 2SC1364
Q101 2SC1419
IC101 μPC78M05 VOLT. REG
D112,113 HZ7B2L
Q106,107 2SA678 VOLT. REG
Q108 2SA755
D109,110 1S1555
Q109 2SC1364 POWER SUPPLY OFF RESET
Q110 2SC1364 POWER SUPPLY ON RESET
D105-108 S1B01-02
S901 POWER
T901 POWER
AC 120V 60Hz
SHUTTER SIDE
H.MFB SENSOR (310Ω/DC)
HC (220Ω/DC)
TONEARM HOR ROTOR
H.MFB DRIVE COIL (85Ω/DC)
POWER SUPPLY FOR TURNTABLE MOTOR
ALWAYS NEGATIVE
(+15V)
(+5V)
(GND)
(-15V)
(+40V)
(GND)
(-40V)


SYSTEM CONTROL BOARD
STYLUS FORCE BOARD
STYLUS FORCE DISPLAY BOARD
POWER SUPPLY BOARD
AC LINE RELAY BOARD
POSITION DETECTION CdS BOARD
POSITION-DETECTION CdS BOARD
US MODEL
BSL TURNTABLE MOTOR
MGH TURNTABLE SPEED DET HEAD
IC501 CX193
IC502 μPC4557
IC503 μPC4557
IC504 μPC4557
IC301 μPC4558
IC302 μPC4558
IC303 μPC4558
IC304 μPC4558
IC305 CX767
IC306 TC4049
IC307 TC4073
IC308 TC4081
IC309 TC4013
IC310 TC4042
IC311 TC4520
IC312 TC4518
IC313,314 TC4511
IC101 μPC78M05
D651 SEL511
D652 SEL511
S901 POWER
T901 POWER
H.MFB SENSOR
H.MFB DRIVE COIL
TONEARM HOR ROTOR
SHUTTER SIDE
AC 120V 60Hz
I
J
K
L
M
N
O
1
2
3
4
5

Note:

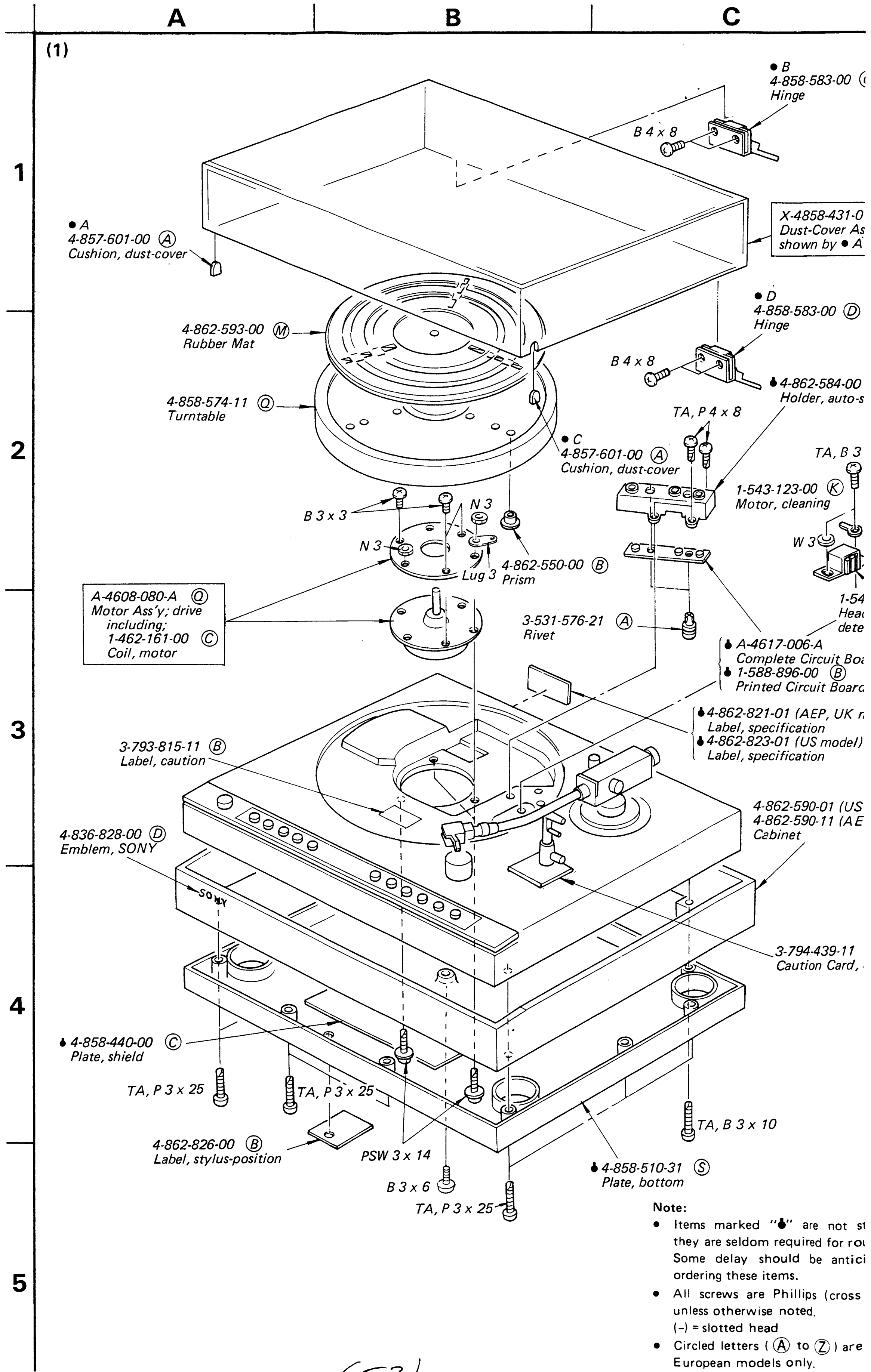
- All capacitors are in μF unless otherwise noted. pF : μμF 50WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in ohms, ¼ W unless otherwise noted. kΩ : 1000 Ω, MΩ : 1000 kΩ
- All variable and adjustable resistors have characteristic curve B, unless otherwise noted.
- 1 % indicates component tolerance.
- ——— : B+ bus.
- – – – : B- bus.
- ▭ : panel designation.
- ▭ : adjustment for repair.
- Voltage readings are taken with an oscilloscope because this set is a microcomputer system, and only reference values. When a VOM of 20 kΩ/V is used for voltage measurements, the microcomputer may jump from these routines shown to a different routine.
- RESET: Period of reset pulse presence (momentary right after POWER is turned ON).
- REST: Periode from the tonearm rested on the tonearm to STAND BY lamp turns off. Normally shown after stabilization. Transients are shown with waveforms.
- FWD: During the tonearm advancing toward turntable.
- RETURN: During the tonearm returning toward the tonearm rest.
- UP: Tonearm is in the upwards motion.
- DOWN: Tonearm is in the downward motion.
- PLAY: After stylus landed on record.
- T. T: Turntable's turn.
- No mark: After POWER turned on and zero balance is finished.
- **Switch**

Ref. No.	Switch	Position
S681	CLEANER	OFF
S682	SPEED	33
S683	REPEAT	OFF
S684	MEMORY RETURN	OFF
S685	MEMORY LEAD IN	OFF
S686	AUTO PLAY	OFF
S687	START /STOP	OFF
S688	UP /DOWN	OFF
S689	ARM ⬅	OFF
S690	ARM ➡	OFF
S901	POWER	OFF

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

MEMO

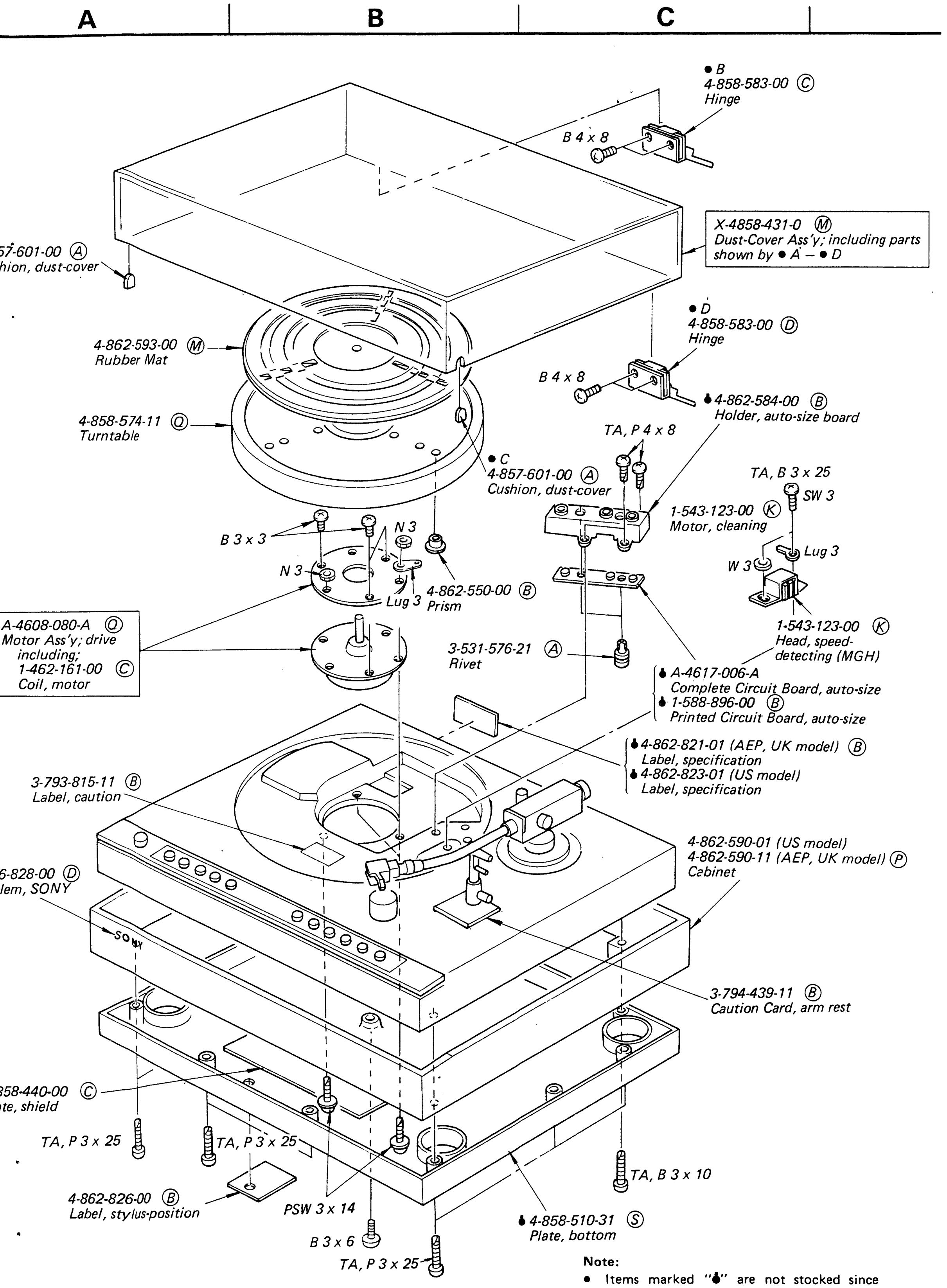
SECTION 5
EXPLODED VIEWS


A
B
C
1
2
3
4
5
(1)
● B
4-858-583-00
Hinge
B 4 x 8
X-4858-431-0
Dust-Cover As
shown by ● A
● A
4-857-601-00 Ⓐ
Cushion, dust-cover
● D
4-858-583-00 Ⓓ
Hinge
4-862-593-00 Ⓜ
Rubber Mat
B 4 x 8
♦ 4-862-584-00
Holder, auto-s
4-858-574-11 Ⓠ
Turntable
TA, P 4 x 8
● C
4-857-601-00 Ⓐ
Cushion, dust-cover
TA, B 3
1-543-123-00 Ⓚ
Motor, cleaning
B 3 x 3
N 3
N 3
W 3
Lug 3
4-862-550-00 Ⓑ
Prism
A-4608-080-A Ⓠ
Motor Ass'y; drive
including;
1-462-161-00 Ⓒ
Coil, motor
1-54
Hea
dete
3-531-576-21 Ⓐ
Rivet
♦ A-4617-006-A
Complete Circuit Bo
♦ 1-588-896-00 Ⓑ
Printed Circuit Boar
♦ 4-862-821-01 (AEP, UK
Label, specification
♦ 4-862-823-01 (US model)
Label, specification
3-793-815-11 Ⓑ
Label, caution
4-862-590-01 (US
4-862-590-11 (AE
Cabinet
4-836-828-00 Ⓓ
Emblem, SONY
SONY
3-794-439-11
Caution Card,
♦ 4-858-440-00 Ⓒ
Plate, shield
TA, P 3 x 25
TA, P 3 x 25
TA, B 3 x 10
4-862-826-00 Ⓑ
Label, stylus-position
PSW 3 x 14
♦ 4-858-510-31 Ⓢ
Plate, bottom
B 3 x 6
TA, P 3 x 25

Note:

- Items marked "♦" are not st they are seldom required for rou Some delay should be antici ordering these items.
- All screws are Phillips (cross unless otherwise noted.
  (-) = slotted head
- Circled letters (Ⓐ to Ⓩ) are European models only.

SECTION 5
EXPLODED VIEWS

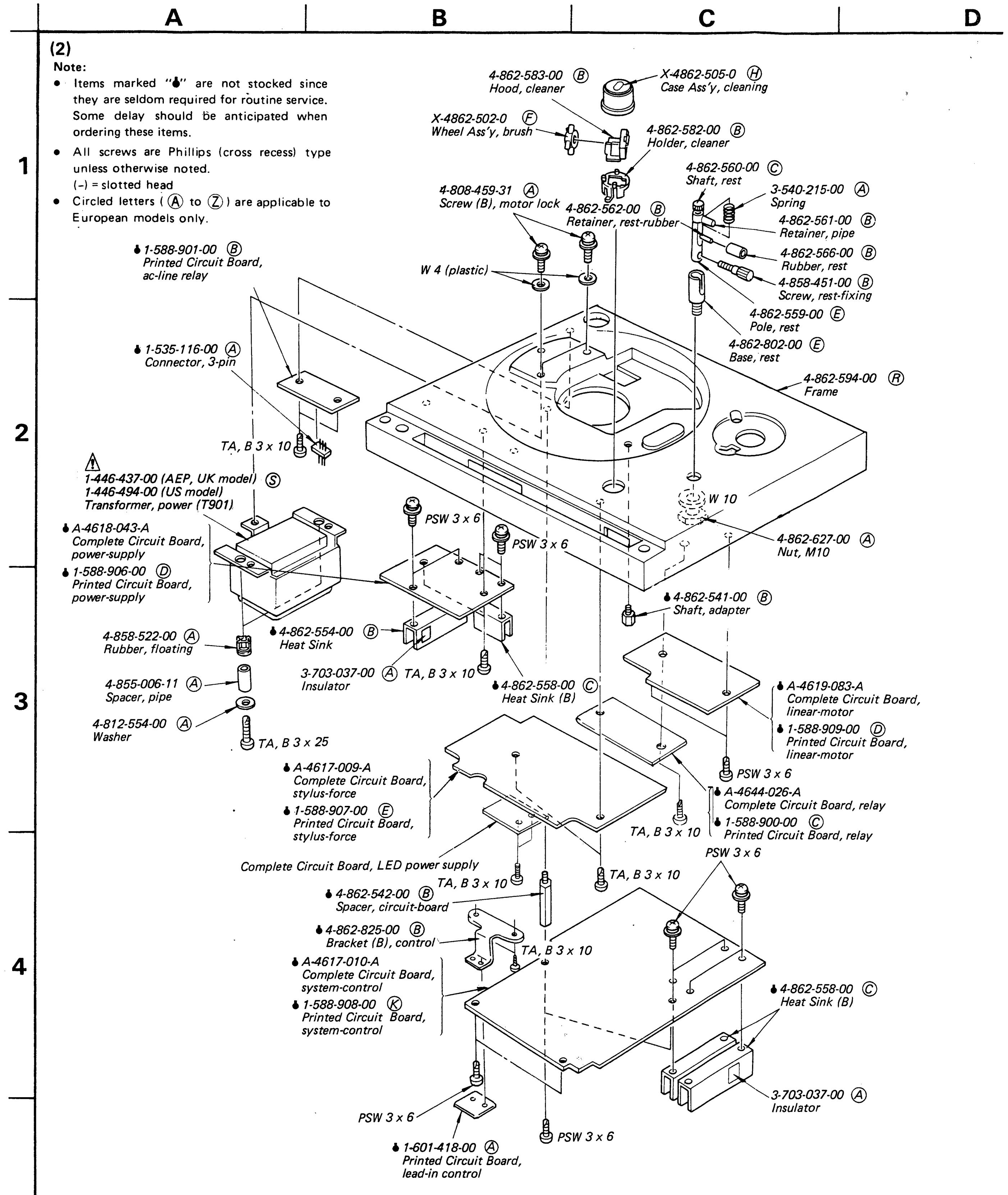

A
B
C
● B
4-858-583-00 Ⓒ
Hinge
B 4 x 8
X-4858-431-0 Ⓜ
Dust-Cover Ass'y; including parts shown by ● A – ● D
57-601-00 Ⓐ
hion, dust-cover
4-862-593-00 Ⓜ
Rubber Mat
● D
4-858-583-00 Ⓓ
Hinge
B 4 x 8
♦ 4-862-584-00 Ⓑ
Holder, auto-size board
4-858-574-11 Ⓠ
Turntable
TA, P 4 x 8
● C
4-857-601-00 Ⓐ
Cushion, dust-cover
TA, B 3 x 25
SW 3
1-543-123-00 Ⓚ
Motor, cleaning
B 3 x 3
N 3
N 3
Lug 3
4-862-550-00 Ⓑ
Prism
W 3
Lug 3
A-4608-080-A Ⓠ
Motor Ass'y; drive including;
1-462-161-00 Ⓒ
Coil, motor
3-531-576-21 Ⓐ
Rivet
1-543-123-00 Ⓚ
Head, speed-detecting (MGH)
♦ A-4617-006-A
Complete Circuit Board, auto-size
♦ 1-588-896-00 Ⓑ
Printed Circuit Board, auto-size
♦ 4-862-821-01 (AEP, UK model) Ⓑ
Label, specification
♦ 4-862-823-01 (US model)
Label, specification
3-793-815-11 Ⓑ
Label, caution
6-828-00 Ⓓ
lem, SONY
SONY
4-862-590-01 (US model)
4-862-590-11 (AEP, UK model) Ⓟ
Cabinet
3-794-439-11 Ⓑ
Caution Card, arm rest
358-440-00 Ⓒ
te, shield
TA, P 3 x 25
TA, P 3 x 25
TA, B 3 x 10
4-862-826-00 Ⓑ
Label, stylus-position
PSW 3 x 14
♦ 4-858-510-31 Ⓢ
Plate, bottom
B 3 x 6
TA, P 3 x 25

Note:
- Items marked "♦" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (-) = slotted head
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

(53)

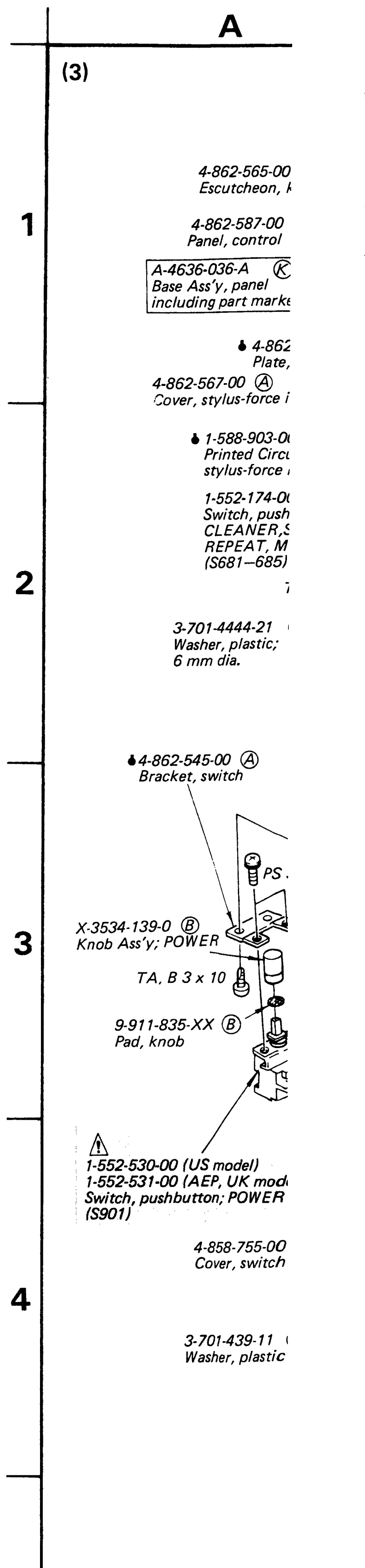
(2)

Note:
- Items marked "♦" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (-) = slotted head
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.


A
B
C
D
1
2
3
4
5
4-862-583-00 Ⓑ
Hood, cleaner
X-4862-505-0 Ⓗ
Case Ass'y, cleaning
X-4862-502-0 Ⓕ
Wheel Ass'y, brush
4-862-582-00 Ⓑ
Holder, cleaner
4-862-560-00 Ⓒ
Shaft, rest
4-808-459-31 Ⓐ
Screw (B), motor lock
4-862-562-00 Ⓑ
Retainer, rest-rubber
3-540-215-00 Ⓐ
Spring
4-862-561-00 Ⓑ
Retainer, pipe
4-862-566-00 Ⓑ
Rubber, rest
♦ 1-588-901-00 Ⓑ
Printed Circuit Board, ac-line relay
W 4 (plastic)
4-858-451-00 Ⓑ
Screw, rest-fixing
4-862-559-00 Ⓔ
Pole, rest
4-862-802-00 Ⓔ
Base, rest
♦ 1-535-116-00 Ⓐ
Connector, 3-pin
4-862-594-00 Ⓡ
Frame
TA, B 3 x 10
1-446-437-00 (AEP, UK model) Ⓢ
1-446-494-00 (US model)
Transformer, power (T901)
W 10
♦ A-4618-043-A
Complete Circuit Board, power-supply
♦ 1-588-906-00 Ⓓ
Printed Circuit Board, power-supply
PSW 3 x 6
PSW 3 x 6
4-862-627-00 Ⓐ
Nut, M10
♦ 4-862-541-00 Ⓑ
Shaft, adapter
4-858-522-00 Ⓐ
Rubber, floating
♦ 4-862-554-00 Ⓑ
Heat Sink
3-703-037-00 Ⓐ
Insulator
TA, B 3 x 10
♦ 4-862-558-00 Ⓒ
Heat Sink (B)
4-855-006-11 Ⓐ
Spacer, pipe
4-812-554-00 Ⓐ
Washer
TA, B 3 x 25
♦ A-4619-083-A
Complete Circuit Board, linear-motor
♦ 1-588-909-00 Ⓓ
Printed Circuit Board, linear-motor
PSW 3 x 6
♦ A-4617-009-A
Complete Circuit Board, stylus-force
♦ 1-588-907-00 Ⓔ
Printed Circuit Board, stylus-force
♦ A-4644-026-A
Complete Circuit Board, relay
TA, B 3 x 10
♦ 1-588-900-00 Ⓒ
Printed Circuit Board, relay
PSW 3 x 6
Complete Circuit Board, LED power supply
TA, B 3 x 10
TA, B 3 x 10
♦ 4-862-542-00 Ⓑ
Spacer, circuit-board
♦ 4-862-825-00 Ⓑ
Bracket (B), control
TA, B 3 x 10
♦ A-4617-010-A
Complete Circuit Board, system-control
♦ 1-588-908-00 Ⓚ
Printed Circuit Board, system-control
♦ 4-862-558-00 Ⓒ
Heat Sink (B)
3-703-037-00 Ⓐ
Insulator
PSW 3 x 6
PSW 3 x 6
♦ 1-601-418-00 Ⓐ
Printed Circuit Board, lead-in control

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

(3)

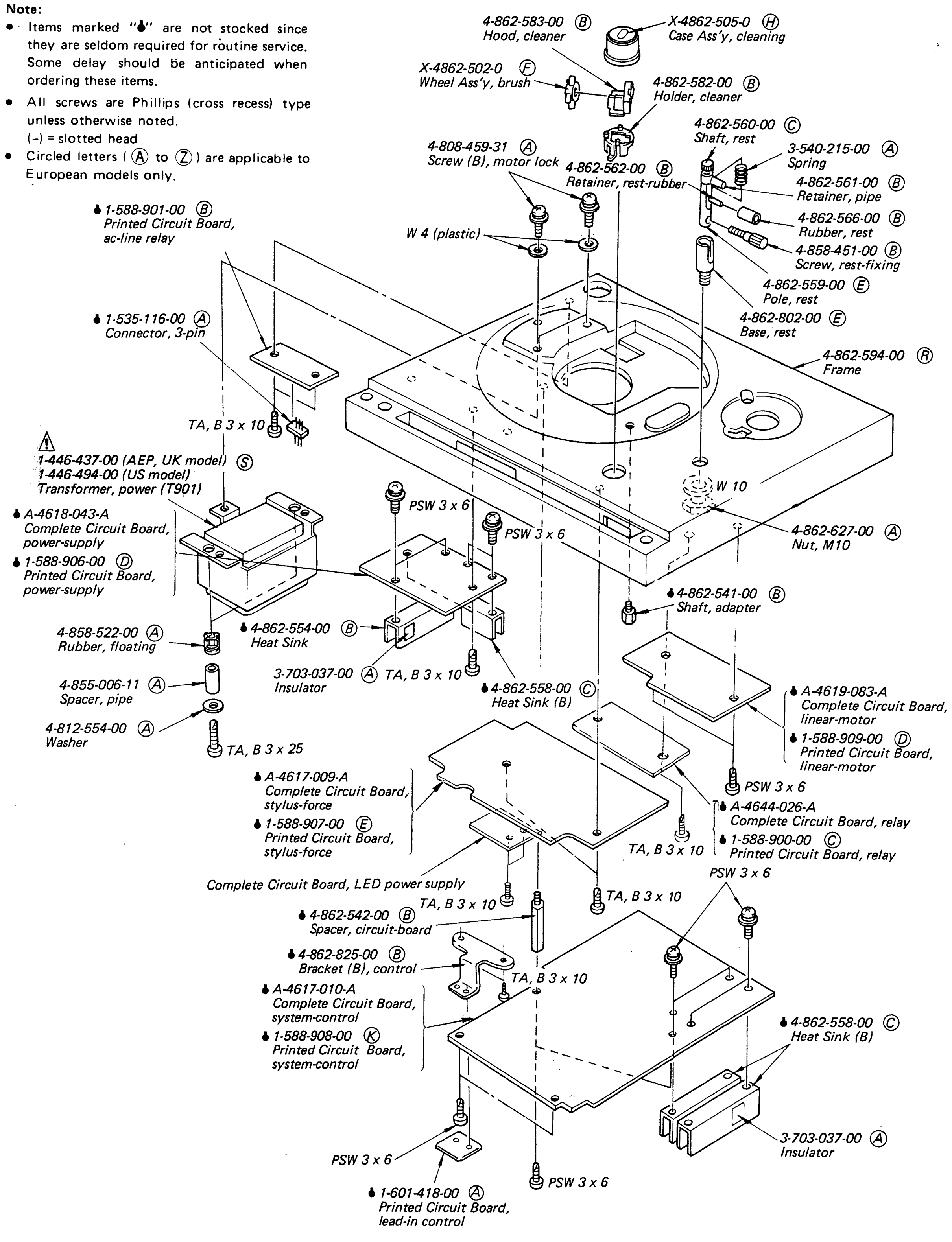

A
1
2
3
4
5
4-862-565-00
Escutcheon, I
4-862-587-00
Panel, control
A-4636-036-A Ⓚ
Base Ass'y, panel including part marke
♦ 4-862
Plate,
4-862-567-00 Ⓐ
Cover, stylus-force i
♦ 1-588-903-0
Printed Circu
stylus-force
1-552-174-0
Switch, push
CLEANER,S
REPEAT, M
(S681–685)
3-701-4444-21
Washer, plastic;
6 mm dia.
♦ 4-862-545-00 Ⓐ
Bracket, switch
PS
X-3534-139-0 Ⓑ
Knob Ass'y; POWER
TA, B 3 x 10
9-911-835-XX Ⓑ
Pad, knob
⚠
1-552-530-00 (US model)
1-552-531-00 (AEP, UK mod
Switch, pushbutton; POWER
(S901)
4-858-755-00
Cover, switch
3-701-439-11
Washer, plastic

Note: The compone
⚠ are critica
part number s

(2)

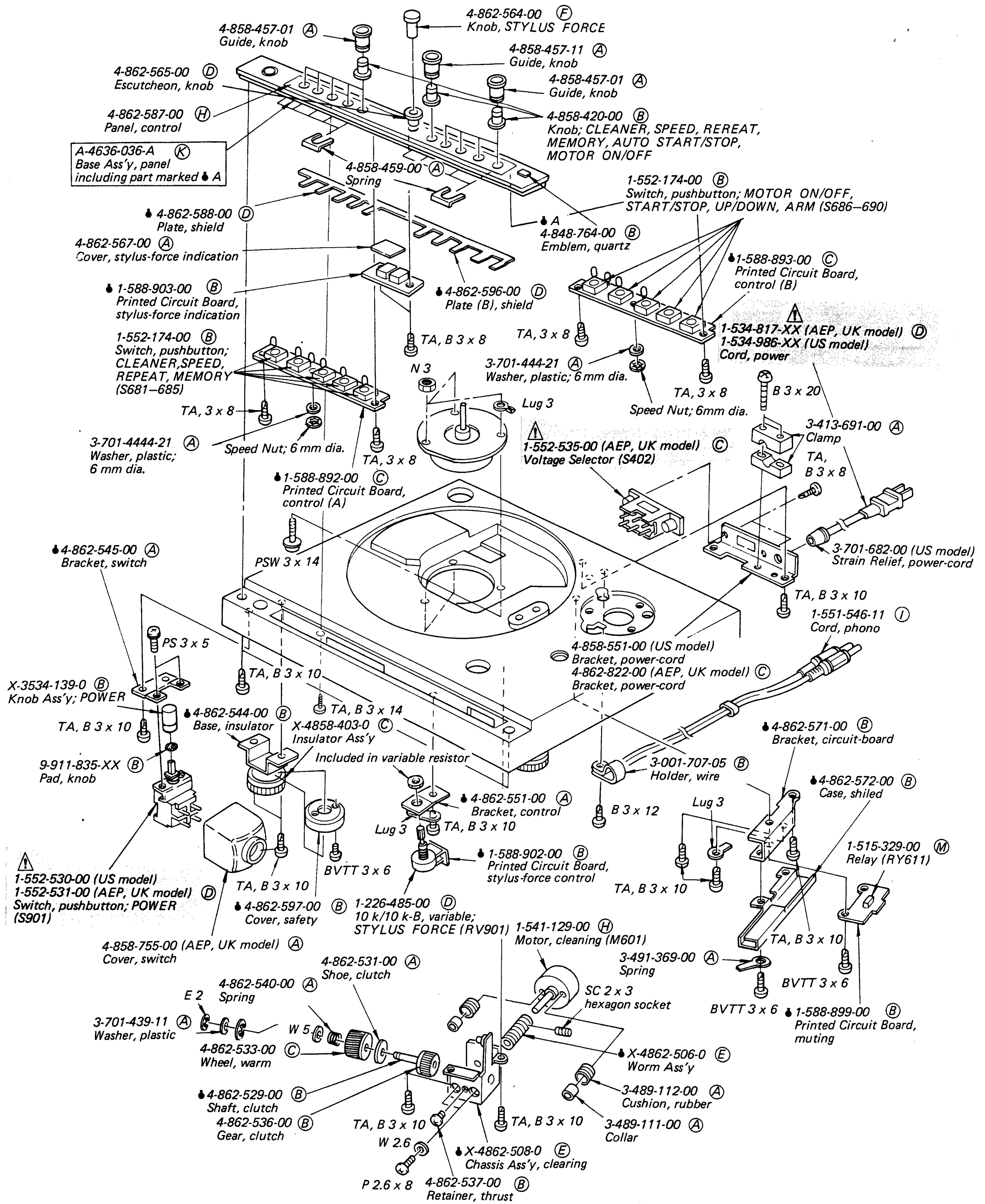
Note:

- Items marked "♠" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (-) = slotted head
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.


4-862-583-00 Ⓑ Hood, cleaner
X-4862-505-0 Ⓗ Case Ass'y, cleaning
X-4862-502-0 Ⓕ Wheel Ass'y, brush
4-862-582-00 Ⓑ Holder, cleaner
4-862-560-00 Ⓒ Shaft, rest
4-808-459-31 Ⓐ Screw (B), motor lock
3-540-215-00 Ⓐ Spring
4-862-562-00 Ⓑ Retainer, rest-rubber
4-862-561-00 Ⓑ Retainer, pipe
♠ 1-588-901-00 Ⓑ Printed Circuit Board, ac-line relay
4-862-566-00 Ⓑ Rubber, rest
W 4 (plastic)
4-858-451-00 Ⓑ Screw, rest-fixing
4-862-559-00 Ⓔ Pole, rest
♠ 1-535-116-00 Ⓐ Connector, 3-pin
4-862-802-00 Ⓔ Base, rest
4-862-594-00 Ⓡ Frame
TA, B 3 x 10
⚠ 1-446-437-00 (AEP, UK model) Ⓢ 1-446-494-00 (US model) Transformer, power (T901)
W 10
PSW 3 x 6
♠ A-4618-043-A Complete Circuit Board, power-supply
♠ 1-588-906-00 Ⓓ Printed Circuit Board, power-supply
PSW 3 x 6
4-862-627-00 Ⓐ Nut, M10
♠ 4-862-541-00 Ⓑ Shaft, adapter
4-858-522-00 Ⓐ Rubber, floating
♠ 4-862-554-00 Ⓑ Heat Sink
4-855-006-11 Ⓐ Spacer, pipe
3-703-037-00 Ⓐ Insulator
TA, B 3 x 10
♠ 4-862-558-00 Ⓒ Heat Sink (B)
♠ A-4619-083-A Complete Circuit Board, linear-motor
♠ 1-588-909-00 Ⓓ Printed Circuit Board, linear-motor
4-812-554-00 Ⓐ Washer
TA, B 3 x 25
♠ A-4617-009-A Complete Circuit Board, stylus-force
♠ 1-588-907-00 Ⓔ Printed Circuit Board, stylus-force
PSW 3 x 6
♠ A-4644-026-A Complete Circuit Board, relay
♠ 1-588-900-00 Ⓒ Printed Circuit Board, relay
TA, B 3 x 10
Complete Circuit Board, LED power supply
PSW 3 x 6
TA, B 3 x 10
TA, B 3 x 10
♠ 4-862-542-00 Ⓑ Spacer, circuit-board
♠ 4-862-825-00 Ⓑ Bracket (B), control
TA, B 3 x 10
♠ A-4617-010-A Complete Circuit Board, system-control
♠ 1-588-908-00 Ⓚ Printed Circuit Board, system-control
♠ 4-862-558-00 Ⓒ Heat Sink (B)
3-703-037-00 Ⓐ Insulator
PSW 3 x 6
PSW 3 x 6
♠ 1-601-418-00 Ⓐ Printed Circuit Board, lead-in control

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

(3)


4-862-564-00 Ⓕ Knob, STYLUS FORCE
4-858-457-01 Ⓐ Guide, knob
4-858-457-11 Ⓐ Guide, knob
4-862-565-00 Ⓓ Escutcheon, knob
4-858-457-01 Ⓐ Guide, knob
4-862-587-00 Ⓗ Panel, control
4-858-420-00 Ⓑ Knob; CLEANER, SPEED, REREAT, MEMORY, AUTO START/STOP, MOTOR ON/OFF
A-4636-036-A Ⓚ Base Ass'y, panel including part marked ♠ A
4-858-459-00 Ⓐ Spring
1-552-174-00 Ⓑ Switch, pushbutton; MOTOR ON/OFF, START/STOP, UP/DOWN, ARM (S686–690)
♠ 4-862-588-00 Ⓓ Plate, shield
♠ A
4-848-764-00 Ⓑ Emblem, quartz
4-862-567-00 Ⓐ Cover, stylus-force indication
♠ 1-588-893-00 Ⓒ Printed Circuit Board, control (B)
♠ 1-588-903-00 Ⓑ Printed Circuit Board, stylus-force indication
♠ 4-862-596-00 Ⓓ Plate (B), shield
⚠ 1-534-817-XX (AEP, UK model) Ⓓ 1-534-986-XX (US model) Cord, power
1-552-174-00 Ⓑ Switch, pushbutton; CLEANER, SPEED, REPEAT, MEMORY (S681–685)
TA, B 3 x 8
TA, 3 x 8
3-701-444-21 Ⓐ Washer, plastic; 6 mm dia.
N 3
TA, 3 x 8
B 3 x 20
Lug 3
Speed Nut; 6mm dia.
TA, 3 x 8
3-413-691-00 Ⓐ Clamp
3-701-4444-21 Ⓐ Washer, plastic; 6 mm dia.
Speed Nut; 6 mm dia.
TA, 3 x 8
⚠ 1-552-535-00 (AEP, UK model) Ⓒ Voltage Selector (S402)
TA, B 3 x 8
♠ 1-588-892-00 Ⓒ Printed Circuit Board, control (A)
♠ 4-862-545-00 Ⓐ Bracket, switch
PSW 3 x 14
3-701-682-00 (US model) Strain Relief, power-cord
TA, B 3 x 10
1-551-546-11 Ⓘ Cord, phono
PS 3 x 5
4-858-551-00 (US model) Bracket, power-cord
4-862-822-00 (AEP, UK model) Ⓒ Bracket, power-cord
TA, B 3 x 10
X-3534-139-0 Ⓑ Knob Ass'y; POWER
TA, B 3 x 14
♠ 4-862-544-00 Ⓑ Base, insulator
TA, B 3 x 10
X-4858-403-0 Ⓒ Insulator Ass'y
♠ 4-862-571-00 Ⓑ Bracket, circuit-board
Included in variable resistor
9-911-835-XX Ⓑ Pad, knob
3-001-707-05 Ⓑ Holder, wire
♠ 4-862-572-00 Ⓑ Case, shiled
♠ 4-862-551-00 Ⓐ Bracket, control
B 3 x 12
Lug 3
Lug 3
TA, B 3 x 10
BVTT 3 x 6
♠ 1-588-902-00 Ⓑ Printed Circuit Board, stylus-force control
1-515-329-00 Ⓜ Relay (RY611)
⚠ 1-552-530-00 (US model) 1-552-531-00 (AEP, UK model) Ⓓ Switch, pushbutton; POWER (S901)
TA, B 3 x 10
TA, B 3 x 10
♠ 4-862-597-00 Ⓑ Cover, safety
1-226-485-00 Ⓓ 10 k/10 k-B, variable; STYLUS FORCE (RV901)
1-541-129-00 Ⓗ Motor, cleaning (M601)
TA, B 3 x 10
4-858-755-00 (AEP, UK model) Ⓐ Cover, switch
3-491-369-00 Ⓐ Spring
4-862-531-00 Ⓐ Shoe, clutch
BVTT 3 x 6
E 2
4-862-540-00 Ⓐ Spring
SC 2 x 3 hexagon socket
BVTT 3 x 6
♠ 1-588-899-00 Ⓑ Printed Circuit Board, muting
3-701-439-11 Ⓐ Washer, plastic
W 5
4-862-533-00 Ⓒ Wheel, warm
♠ X-4862-506-0 Ⓔ Worm Ass'y
♠ 4-862-529-00 Ⓑ Shaft, clutch
3-489-112-00 Ⓐ Cushion, rubber
4-862-536-00 Ⓑ Gear, clutch
TA, B 3 x 10
TA, B 3 x 10
3-489-111-00 Ⓐ Collar
W 2.6
♠ X-4862-508-0 Ⓔ Chassis Ass'y, clearing
P 2.6 x 8
4-862-537-00 Ⓑ Retainer, thrust

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

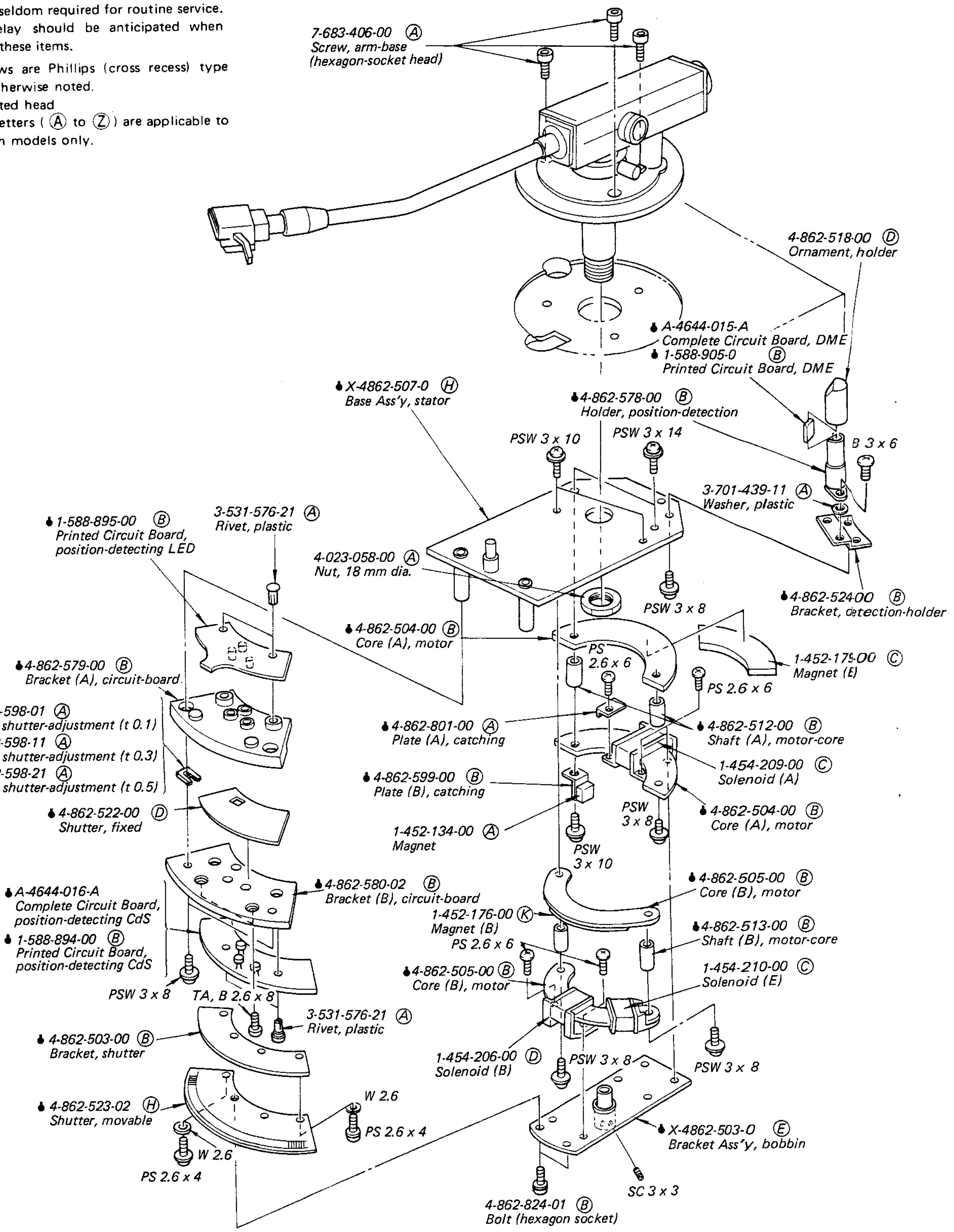
Note:

- Items marked "♠" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (-) = slotted head
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

(4)

Note:

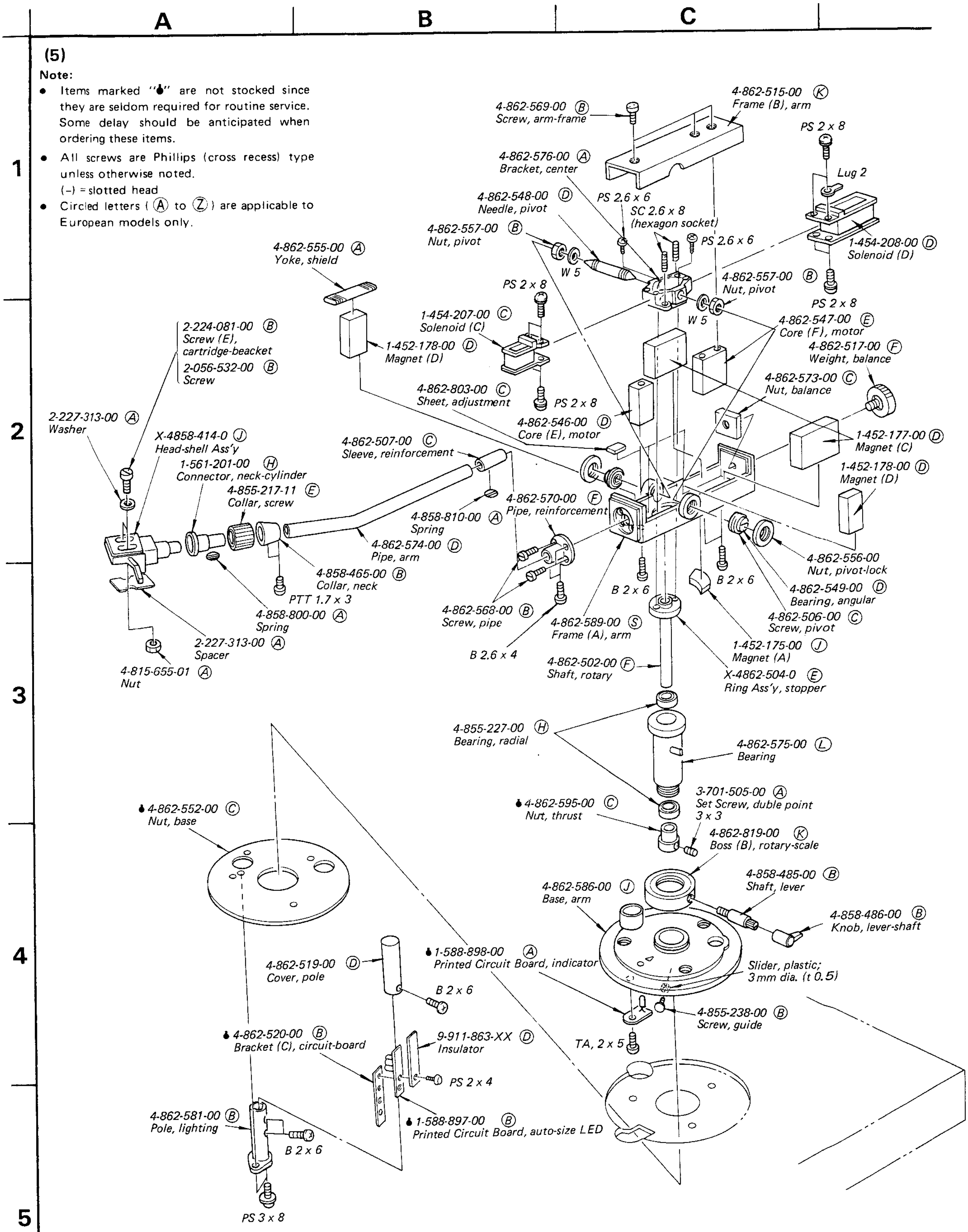
- Items marked "♠" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (-) = slotted head
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.


7-683-406-00 Ⓐ
Screw, arm-base
(hexagon-socket head)
4-862-518-00 Ⓓ
Ornament, holder
♠ A-4644-015-A
Complete Circuit Board, DME
♠ 1-588-905-0 Ⓑ
Printed Circuit Board, DME
♠ X-4862-507-0 Ⓗ
Base Ass'y, stator
♠4-862-578-00 Ⓑ
Holder, position-detection
PSW 3 x 10
PSW 3 x 14
B 3 x 6
3-701-439-11 Ⓐ
Washer, plastic
♠ 1-588-895-00 Ⓑ
Printed Circuit Board,
position-detecting LED
3-531-576-21 Ⓐ
Rivet, plastic
4-023-058-00 Ⓐ
Nut, 18 mm dia.
PSW 3 x 8
♠4-862-524-00 Ⓑ
Bracket, detection-holder
♠4-862-504-00 Ⓑ
Core (A), motor
PS
2.6 x 6
1-452-175-00 Ⓒ
Magnet (E)
♠4-862-579-00 Ⓑ
Bracket (A), circuit-board
PS 2.6 x 6
♠ 4-862-598-01 Ⓐ
Plate, shutter-adjustment (t 0.1)
♠ 4-862-598-11 Ⓐ
Plate, shutter-adjustment (t 0.3)
♠ 4-862-598-21 Ⓐ
Plate, shutter-adjustment (t 0.5)
♠4-862-801-00 Ⓐ
Plate (A), catching
♠ 4-862-512-00 Ⓑ
Shaft (A), motor-core
1-454-209-00 Ⓒ
Solenoid (A)
♠4-862-599-00 Ⓑ
Plate (B), catching
♠ 4-862-522-00 Ⓓ
Shutter, fixed
1-452-134-00 Ⓐ
Magnet
PSW
3 x 8
♠ 4-862-504-00 Ⓑ
Core (A), motor
PSW
3 x 10
♠ 4-862-505-00 Ⓑ
Core (B), motor
♠A-4644-016-A
Complete Circuit Board,
position-detecting CdS
♠ 1-588-894-00 Ⓑ
Printed Circuit Board,
position-detecting CdS
♠4-862-580-02 Ⓑ
Bracket (B), circuit-board
1-452-176-00 Ⓚ
Magnet (B)
PS 2.6 x 6
♠4-862-513-00 Ⓑ
Shaft (B), motor-core
♠4-862-505-00 Ⓑ
Core (B), motor
1-454-210-00 Ⓒ
Solenoid (E)
PSW 3 x 8
TA, B 2.6 x 8
3-531-576-21 Ⓐ
Rivet, plastic
♠ 4-862-503-00 Ⓑ
Bracket, shutter
1-454-206-00 Ⓓ
Solenoid (B)
PSW 3 x 8
PSW 3 x 8
♠ 4-862-523-02 Ⓗ
Shutter, movable
W 2.6
PS 2.6 x 4
W 2.6
PS 2.6 x 4
♠X-4862-503-0 Ⓔ
Bracket Ass'y, bobbin
SC 3 x 3
4-862-824-01 Ⓑ
Bolt (hexagon socket)

(5)

Note:

- Items marked "♠" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (–) = slotted head
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.


A
B
C
1
2
3
4
5
4-862-569-00 Ⓑ
Screw, arm-frame
4-862-515-00 Ⓚ
Frame (B), arm
PS 2 x 8
Lug 2
4-862-576-00 Ⓐ
Bracket, center
4-862-548-00 Ⓓ
Needle, pivot
PS 2.6 x 6
SC 2.6 x 8
(hexagon socket)
PS 2.6 x 6
4-862-557-00 Ⓑ
Nut, pivot
1-454-208-00 Ⓓ
Solenoid (D)
4-862-555-00 Ⓐ
Yoke, shield
W 5
4-862-557-00 Ⓑ
Nut, pivot
PS 2 x 8
PS 2 x 8
W 5
1-454-207-00 Ⓒ
Solenoid (C)
4-862-547-00 Ⓔ
Core (F), motor
2-224-081-00 Ⓑ
Screw (E),
cartridge-beacket
2-056-532-00 Ⓑ
Screw
1-452-178-00 Ⓓ
Magnet (D)
4-862-517-00 Ⓕ
Weight, balance
4-862-573-00 Ⓒ
Nut, balance
4-862-803-00 Ⓒ
Sheet, adjustment
PS 2 x 8
2-227-313-00 Ⓐ
Washer
4-862-546-00 Ⓓ
Core (E), motor
1-452-177-00 Ⓓ
Magnet (C)
X-4858-414-0 Ⓙ
Head-shell Ass'y
4-862-507-00 Ⓒ
Sleeve, reinforcement
1-452-178-00 Ⓓ
Magnet (D)
1-561-201-00 Ⓗ
Connector, neck-cylinder
4-855-217-11 Ⓔ
Collar, screw
4-862-570-00 Ⓕ
Pipe, reinforcement
4-858-810-00 Ⓐ
Spring
4-862-574-00 Ⓓ
Pipe, arm
4-862-556-00
Nut, pivot-lock
4-858-465-00 Ⓑ
Collar, neck
B 2 x 6
B 2 x 6
4-862-549-00 Ⓓ
Bearing, angular
PTT 1.7 x 3
4-862-568-00 Ⓑ
Screw, pipe
4-858-800-00 Ⓐ
Spring
4-862-589-00 Ⓢ
Frame (A), arm
4-862-506-00 Ⓒ
Screw, pivot
2-227-313-00 Ⓐ
Spacer
B 2.6 x 4
1-452-175-00 Ⓙ
Magnet (A)
4-815-655-01 Ⓐ
Nut
4-862-502-00 Ⓕ
Shaft, rotary
X-4862-504-0 Ⓔ
Ring Ass'y, stopper
4-855-227-00 Ⓗ
Bearing, radial
4-862-575-00 Ⓛ
Bearing
3-701-505-00 Ⓐ
Set Screw, duble point
3 x 3
♠ 4-862-552-00 Ⓒ
Nut, base
♠ 4-862-595-00 Ⓒ
Nut, thrust
4-862-819-00 Ⓚ
Boss (B), rotary-scale
4-858-485-00 Ⓑ
Shaft, lever
4-862-586-00 Ⓙ
Base, arm
4-858-486-00 Ⓑ
Knob, lever-shaft
4-862-519-00 Ⓓ
Cover, pole
♠ 1-588-898-00 Ⓐ
Printed Circuit Board, indicator
Slider, plastic;
3 mm dia. (t 0.5)
B 2 x 6
4-855-238-00 Ⓑ
Screw, guide
♠ 4-862-520-00 Ⓑ
Bracket (C), circuit-board
9-911-863-XX Ⓓ
Insulator
TA, 2 x 5
PS 2 x 4
4-862-581-00 Ⓑ
Pole, lighting
♠ 1-588-897-00 Ⓑ
Printed Circuit Board, auto-size LED
B 2 x 6
PS 3 x 8

SECTION 6
ELECTRICAL PARTS LIST

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

SEMICONDUCTORS

Transistors

Ref. No.	*Part No.*	*Description*
Q001, 002	8-729-663-47	Ⓑ 2SC1364
⇒Q003	8-729-203-04	Ⓑ 2SK30A
⇒Q004	8-760-335-10	Ⓑ 2SC1474
⇒Q101	8-729-316-12	Ⓓ 2SC1061
Q102, 103	8-729-663-47	Ⓑ 2SC1364
⇒Q104, 105	8-729-203-04	Ⓑ 2SK30A
⇒Q106, 107	8-729-612-77	Ⓑ 2SA1027R
⇒Q108	8-729-317-12	Ⓓ 2SA671
Q109, 110	8-729-663-47	Ⓑ 2SC1364
Q201	8-729-141-43	Ⓑ 2SD414
Q202	8-729-154-83	Ⓒ 2SB548
Q204	8-729-154-83	Ⓒ 2SB548
Q205	8-729-141-43	Ⓑ 2SD414
Q206	8-729-154-83	Ⓒ 2SB548
⇒Q207 ⇒Q210–222	8-729-203-04	Ⓑ 2SK30A
Q401	8-760-413-10	Ⓑ 2SC1475
⇒Q402, 403	8-729-203-04	Ⓑ 2SK30A
Q501, 502	8-729-663-47	Ⓑ 2SC1364
⇒Q503, 504	8-729-612-77	Ⓑ 2SA1027R
Q505	8-729-663-47	Ⓑ 2SC1364
⇒Q506	8-729-612-77	Ⓑ 2SA1027R
⇒Q507, 508	8-720-950-03	Ⓓ 2SC926A
Q509	8-729-307-62	Ⓓ 2SD476A
⇒Q510	8-729-612-77	Ⓑ 2SA1027R
Q511	8-729-306-62	Ⓓ 2SB566A
⇒Q512	8-729-612-77	Ⓑ 2SA1027R
⇒Q513, 514	8-720-950-03	Ⓓ 2SC926A
Q515	8-729-307-62	Ⓓ 2SD476A
⇒Q516	8-729-612-77	Ⓑ 2SA1027R
Q517	8-729-306-62	Ⓓ 2SB566A
Q601	8-729-663-47	Ⓑ 2SC1364
⇒Q602	8-760-335-10	Ⓑ 2SC1474
Q603 Q611, 612	8-729-663-47	Ⓑ 2SC1364

Ref. No.	*Part No.*	*Description*
⇒Q621–623	8-729-101-01	PH101
Q624–626	8-729-101-02	PH102

ICs

Ref. No.	*Part No.*	*Description*
⇒IC101	8-759-143-05	Ⓕ μPC14305H
⇒IC201–203	8-759-145-57	Ⓓ μPC4557C
⇒IC204–207	8-759-145-58	Ⓓ μPC4558C
⇒IC208	8-759-700-58	Ⓓ NJM4558DFA
⇒IC209	8-759-145-58	Ⓓ μPC4558C
IC301–304	8-759-145-58	Ⓓ μPC4558C
IC305	8-759-907-67	Ⓘ CX767
⇒IC306	8-759-140-49	Ⓒ μPD4049C
⇒IC307	8-759-240-73	Ⓒ TC4073BP
⇒IC308	8-759-240-81	Ⓓ TC4081BP
⇒IC309	8-759-240-13	Ⓓ TC4013BP
⇒IC310	8-759-240-42	Ⓕ TC4042BP
⇒IC311	8-759-245-20	Ⓙ TC4520BP
⇒IC312	8-759-245-18	Ⓙ TC4518BP
⇒IC313, 314	8-759-245-11	Ⓗ TC4511BP
⇒IC401–403	8-759-145-58	Ⓓ μPC4558C
⇒IC404	8-759-145-57	Ⓓ μPC4557C
⇒IC405–410	8-759-145-58	Ⓓ μPC4558C
⇒IC411	8-759-240-81	Ⓓ TC4081BP
⇒IC412	8-759-140-49	Ⓒ μPD4049C
IC413	8-759-904-69	Ⓒ MSM4069
⇒IC414	8-759-981-15	Ⓟ MB8841-125
⇒IC415	8-759-240-28	Ⓙ TC4028BP
⇒IC416–421	8-759-240-42	Ⓕ TC4042BP
⇒IC422	8-759-145-58	Ⓓ μPC4558C
IC501	8-751-930-00	Ⓚ CX193
⇒IC502–504	8-759-145-57	Ⓓ μPC4557C

Diodes

Ref. No.	*Part No.*	*Description*
⇒D001, 002	8-719-815-55	Ⓑ 1S1555
⇒D003–007	8-719-931-18	Ⓑ EQB01-18
⇒D008	8-719-815-55	Ⓑ 1S1555
⇒D101–108 ⚠	8-719-200-02	Ⓑ 10E2
D109, 110	8-719-815-55	Ⓑ 1S1555
D112, 113	8-719-910-75	Ⓑ HZ7B2L

⇒: Due to standardization, interchangeable replacements may be substituted for parts specified in the diagrams.

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	*Part No.*	*Description*
D201, 202	8-719-815-55	Ⓑ 1S1555
D203, 204	8-719-910-65	Ⓑ HZ6B2L
D205–223	8-719-815-55	Ⓑ 1S1555
D301	8-719-910-65	Ⓑ HZ6B2L
⇒D302, 303	8-719-815-55	Ⓑ 1S1555
⇒D304	8-719-931-05	Ⓑ EQB01-05
⇒D305	8-719-815-55	Ⓑ 1S1555
D401	8-719-910-65	Ⓑ HZ6B2L
⇒D402	8-719-815-55	Ⓑ 1S1555
D403	8-719-910-65	Ⓑ HZ6B2L
⇒D404–410	8-719-815-55	Ⓑ 1S1555
⇒D412	8-719-815-55	Ⓑ 1S1555
⇒D501–503	8-719-815-55	Ⓑ 1S1555
⇒D504, 505	8-719-931-18	Ⓑ EQB01-18
D506, 507	8-719-122-10	Ⓑ VD1221
⇒D508–511 D611, 612	8-719-815-55	Ⓑ 1S1555
⇒D631–633	8-719-103-03	Ⓒ SE303A
D641–643	8-719-812-31	Ⓑ TLR123
D651, 652	8-719-305-11	Ⓔ SEL511
D681–691	8-719-900-24	Ⓒ SLP24B
DM661, 662	8-745-101-01	Ⓒ DM101

CAPACITORS

All capacitors are in μF and ceramic unless otherwise noted. 50 WV or less are not indicated except for electrolytics. pF: μμF, elect: electrolytic

Ref. No.	*Part No.*	*Description*		
C101, 102	⚠1-123-155-00	Ⓑ 6800	35V	elect
C103, 104	⚠1-123-364-00	Ⓑ 1000	50V	elect
C105	1-123-351-00	Ⓑ 0.47	50V	elect
C106, 107	1-123-306-00	Ⓑ 47	10V	elect
C108, 109	1-123-321-00	Ⓑ 220	16V	elect
C110	1-123-298-00	Ⓑ 470	6.3V	elect
C111	1-123-328-00	Ⓑ 4.7	25V	elect
C112	1-123-352-00	Ⓑ 1	50V	elect
C201, 202	1-108-595-00	Ⓑ 0.047		mylar
C203, 204	1-123-320-00	Ⓑ 100	16V	elect
C205	1-108-571-00	Ⓑ 0.0047		mylar
C206	1-108-587-00	Ⓑ 0.022		mylar
C207	1-123-320-00	Ⓑ 100	16V	elect
C291	1-102-112-00	Ⓐ 330p		
C301	1-123-351-00	Ⓑ 0.47	50V	elect
C302	1-123-232-00	Ⓑ 4.7	50V	elect (nonpolarized)
C303	1-123-230-00	Ⓑ 2.2	50V	elect (nonpolarized)
C304	1-123-352-00	Ⓑ 1	50V	elect
C305, 306	1-102-110-00	Ⓐ 220p		
C307	1-101-004-00	Ⓐ 0.01		
C401, 402	1-123-319-00	Ⓑ 47	16V	elect
C403	1-123-228-00	Ⓑ 1	50V	elect (nonpolarized)
C404	1-108-239-00	Ⓐ 0.01		mylar
C405	1-108-567-00	Ⓑ 0.0033		mylar
C406	1-130-062-00	Ⓑ 0.0056	630V	plastic
C407	1-107-096-00	Ⓐ 300p	50V	mica
C409, 410	1-102-112-00	Ⓐ 330p		
C411–413	1-123-351-00	Ⓑ 0.47	50V	elect
C414–417	1-123-353-00	Ⓑ 2.2	50V	elect
C418	1-102-112-00	Ⓐ 330p		
C419, 420	1-123-353-00	Ⓑ 2.2	50V	elect
C421	1-102-112-00	Ⓐ 330p		
C422, 423	1-123-353-00	Ⓑ 2.2	50V	elect
C424	1-102-112-00	Ⓐ 330p		
C425	1-123-353-00	Ⓑ 2.2	50V	elect
C426, 427	1-102-943-00	Ⓐ 6p		
C451	1-123-320-00	Ⓑ 100	16V	elect
C452	1-108-239-00	Ⓐ 0.01		mylar
C453	1-123-320-00	Ⓑ 100	16V	elect
C454, 455	1-108-239-00	Ⓐ 0.01		mylar
C456	1-123-295-00	Ⓑ 100	6.3V	elect
C457	1-108-239-00	Ⓐ 0.01		mylar
C498	1-123-228-00	Ⓑ 1	50V	elect (nonpolarized)
C501	1-131-211-00	Ⓑ 0.22	35V	tantalum
C502	1-108-242-00	Ⓐ 0.022		mylar
C503	1-131-213-00	Ⓑ 0.47	35V	tantalum
C504	1-108-239-00	Ⓐ 0.01		mylar
C505	1-123-329-00	Ⓑ 10	25V	elect

⇒: Due to standardization, interchangeable replacements may be substituted for parts specified in the diagrams.

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	*Part No.*	*Description*		
C506	1-123-332-00	Ⓐ 47	25V	elect
C507	1-123-345-00	Ⓑ 100	35V	elect
C508	1-123-329-00	Ⓑ 10	25V	elect
C509	1-123-332-00	Ⓐ 47	25V	elect
C510	1-123-345-00	Ⓑ 100	35V	elect
C511	1-101-081-00	Ⓐ 130p		
C512	1-102-491-00	Ⓐ 51p		
C513	1-101-081-00	Ⓐ 130p		
C514	1-123-299-00	Ⓑ 1000	6.3V	elect
C515	1-108-239-00	Ⓐ 0.01		mylar
C516	1-108-246-00	Ⓐ 0.047		mylar
C517	1-108-239-00	Ⓐ 0.01		mylar
C518	1-130-188-00	Ⓑ 0.01	100V	plastic
C519	1-108-227-00	Ⓐ 0.001		mylar
C520	1-131-213-00	Ⓑ 0.47	35V	tantalum
C521	1-108-246-00	Ⓐ 0.047		mylar
C522	1-123-316-00	Ⓑ 10	16V	elect
C523	1-108-239-00	Ⓐ 0.01		mylar
C524	1-108-246-00	Ⓐ 0.047		mylar
C526	1-123-228-00	Ⓑ 1	50V	elect (nonpolarized)
C528, 529	1-108-227-00	Ⓐ 0.001		mylar
C530, 531	1-123-228-00	Ⓑ 1	50V	elect (nonpolarized)
C532, 533	1-108-227-00	Ⓐ 0.001		mylar
C535	1-123-228-00	Ⓑ 1	50V	elect (nonpolarized)
C536	1-123-352-00	Ⓑ 1	50V	elect
C597	1-123-295-00	Ⓑ 100	6.3V	elect
C598, 599	1-123-320-00	Ⓑ 100	16V	elect
C601	1-123-306-00	Ⓑ 47	10V	elect
C602	1-123-328-00	Ⓑ 4.7	25V	elect
C901	1-130-196-00	Ⓓ 0.01	300V	polyethylene (AEP, UK model)
C901	⚠1-108-750-00	Ⓑ 0.033	125V	mylar (US model)
C902	⚠1-130-196-00	Ⓓ 0.01	300V	polyethylene (AEP, UK model)
C971	1-123-352-00	Ⓑ 1	50V	elect

RESISTORS

All resistors are in ohms. Common ¼W carbon resistors are omitted. Refer to the list on page 66 for their part numbers. kΩ: 1000 Ω, MΩ: 1000 kΩ.

Ref. No.	*Part No.*	*Description*	
R14	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R15	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R16	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R17	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R18	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R19	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R20	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R21	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R22	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R23	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R24	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R25	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R26	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R27	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R28	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R29	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R30	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R31	1-214-152-00	Ⓐ 6.8 k	¼W(1%) metal oxide
R32	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R33	1-214-148-00	Ⓑ 4.7k	¼W(1%) metal oxide
R34	1-214-146-00	Ⓐ 3.9k	¼W(1%) metal oxide
R35	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R36	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R37	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R38	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R39	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R40	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R41	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R42	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R43–45	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R46	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R47	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide
R48	1-214-156-00	Ⓐ 10k	¼W(1%) metal oxide
R49	1-214-163-00	Ⓐ 20k	¼W(1%) metal oxide

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	*Part No.*	*Description*
R50	1-214-156-00	Ⓐ 10k ¼W(1%) metal oxide
R51	1-214-163-00	Ⓐ 20k ¼W(1%) metal oxide
R60	1-214-166-00	Ⓐ 27k ¼W(1%) metal oxide
R61	⚠1-213-135-00	Ⓐ 220 1W metal oxide (nonflammable)
R122, 123	⚠1-217-422-00	1 ½W fusible (nonflammable)
R124	⚠1-206-471-00	22 2W metal oxide (nonflammable)
R210	1-212-369-00	5.6 1W metal oxide (nonflammable)
R302	1-214-180-00	Ⓐ 100k ¼W(1%) metal oxide
R303	1-214-162-00	Ⓐ 18k ¼W(1%) metal oxide
R319	1-214-156-00	Ⓐ 10k ¼W(1%) metal oxide
R320–327	1-214-163-00	Ⓐ 20k ¼W(1%) metal oxide
R328–331	1-214-156-00	Ⓐ 10k ¼W(1%) metal oxide
R332–337	1-214-163-00	Ⓐ 20k ¼W(1%) metal oxide
R338–340	1-214-156-00	Ⓐ 10k ¼W(1%) metal oxide
R342	1-214-156-00	Ⓐ 10k ¼W(1%) metal oxide
R359, 360	1-214-180-00	Ⓐ 100k ¼W(1%) metal oxide
R402	1-214-180-00	Ⓐ 100k ¼W(1%) metal oxide
R403	1-214-163-00	Ⓐ 20k ¼W(1%) metal oxide
R404, 405	1-214-143-00	Ⓐ 3k ¼W(1%) metal oxide
R406	1-214-162-00	Ⓐ 18k ¼W(1%) metal oxide
R407, 408	1-214-156-00	Ⓐ 10k ¼W(1%) metal oxide (nonflammable)
R410	1-214-122-00	Ⓑ 390 ¼W(1%) metal oxide (nonflammable)
R411	1-214-162-00	Ⓐ 18k ¼W(1%) metal oxide
R412, 413	1-214-164-00	Ⓐ 22k ¼W(1%) metal oxide
R414	1-214-180-00	Ⓐ 100k ¼W(1%) metal oxide
R415	1-214-164-00	Ⓐ 22k ¼W(1%) metal oxide
R419	1-214-164-00	Ⓐ 22k ¼W(1%) metal oxide
R422, 423	1-214-164-00	Ⓐ 22k ¼W(1%) metal oxide
R424	1-212-702-00	Ⓑ 100k ½W(1%) metal oxide
R425	1-214-132-00	Ⓑ 1k ¼W(1%) metal oxide (nonflammable)
R426	1-214-140-00	Ⓐ 2.2k ¼W(1%) metal oxide (nonflammable)

Ref. No.	*Part No.*	*Description*
R511	⚠1-213-142-00	Ⓐ 820 1W metal oxide (nonflammable)
R513	⚠1-213-142-00	Ⓐ 820 1W metal oxide (nonflammable)
R514	⚠1-206-649-00	Ⓐ 240 2W metal oxide (nonflammable)
R524	1-212-713-00	Ⓑ 300k ½W(1%) metal oxide
R525	1-214-176-00	Ⓐ 68k ¼W(1%) metal oxide
R560, 561	⚠1-217-465-00	Ⓑ 0.47 1W fusible (nonflammable)
R973	1-244-861-00	Ⓐ 330 ½W carbon
R978	1-244-857-00	Ⓐ 220 ½W carbon
RV201, 202	1-224-646-XX	Ⓑ 22k-B, adjustable; vert. linear motor offset, down hor. offset (2)
RV203	1-224-491-00	Ⓑ 22k-B, adjustable; vert. balance offset
RV204, 205	1-224-646-XX	Ⓑ 22k-B, adjustable; inside force, down hor. offset (1)
RV301, 302	1-224-646-XX	Ⓑ 22k-B, adjustable; styrus force, stylus force indication
RV401	1-224-661-00	Ⓑ 47k-B, adjustable; tonearm hor.
RV402	1-224-491-00	Ⓑ 22k-B, adjustable; IRQ. freq.
RV403, 404	1-224-663-00	Ⓑ 470k-B, adjustable; slit A, B
RV405	1-224-492-00	Ⓑ 100k-B, adjustable; arm-rest signal
RV406	1-224-254-00	Ⓑ 47k-B, adjustable; lead in
RV501, 502	1-224-492-00	Ⓑ 100k-B, adjustable; speed (45), (33)
RV503–506	1-224-644-XX	Ⓑ 4.7k-B, adjustable; gain (H1), (H2) offset (H1), (H2)
RV901	1-226-485-00	10k/10k-B, variable; STYLUS FORCE

SWITCHES

S402	⚠1-552-535-00	Ⓒ Voltage Selector (AEP, UK model)
S681–685	1-552-174-00	Ⓑ Pushbutton; CLEANER; SPEED, REPEAT, MEMORY
S686–690	1-552-174-00	Ⓑ Pushbutton; MOTOR ON/OFF, START/STOP, UP/DOWN, ARM
S901	⚠1-552-530-00	Pushbutton; POWER (US model)
S901	⚠1-552-531-00	Ⓓ Pushbutton; POWER (AEP, UK model)

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

MISCELLANEOUS

Ref. No.	*Part No.*	*Description*
M601	1-541-129-00	Ⓗ Motor, cleaning
MGH	1-543-123-00	Ⓚ Head, speed-detecting
RY611	1-515-329-00	Ⓜ Relay
RY971	1-515-328-00	Ⓖ Relay
T901	⚠1-446-437-00	Ⓢ Transformer, power (AEP, UK model)
T901	⚠1-446-494-00	Transformer, power (US model)
TH971	1-800-202-XX	Ⓐ Thermistor, S-10k
XT501	1-527-380-21	Ⓓ Crystal, OSC
	A-4608-080-A	Ⓠ Motor Ass'y, drive
	including;	
	1-462-161-00	Ⓒ Coil, motor
	1-452-134-00	Ⓑ Magnet
	1-452-175-00	Ⓙ Magnet (A)
	1-452-176-00	Ⓚ Magnet (B)
	1-452-177-00	Ⓓ Magnet (C)
	1-452-178-00	Ⓓ Magnet (D)
	1-452-179-00	Ⓒ Magnet (E)
	1-454-206-00	Ⓓ Solenoid (B)
	1-454-207-00	Ⓒ Solenoid (C)
	1-454-208-00	Ⓓ Solenoid (D)
	1-454-209-00	Ⓒ Solenoid (A)
	1-454-210-00	Ⓒ Solenoid (E)
	1-462-161-00	Ⓓ Coil, motor
	⚠1-534-817-XX	Ⓓ Cord, power (AEP, UK model)
	⚠1-534-986-XX	Cord, power (US model)
	1-551-546-11	Ⓘ Cord, phono
	1-561-201-00	Connector, neck-cylinder

- Items marked "♠" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Part No.	*Description*
♠ 1-588-892-00	Ⓒ Printed Circuit Board, control (A)
♠ 1-588-893-00	Ⓒ Printed Circuit Board, control (B)
♠ 1-588-894-00	Ⓑ Printed Circuit Board, position detection CdS
♠ 1-588-895-00	Ⓑ Printed Circuit Board, position detection LED
♠ 1-588-896-00	Ⓑ Printed Circuit Board, auto-size
♠ 1-588-897-00	Ⓑ Printed Circuit Board, auto-size LED
♠ 1-588-898-00	Ⓐ Printed Circuit Board, indicator
♠ 1-588-899-00	Ⓑ Printed Circuit Board, muting
♠ 1-588-900-00	Ⓒ Printed Circuit Board, relay
♠ 1-588-901-00	Ⓑ Printed Circuit Board, AC-line relay
♠ 1-588-902-00	Ⓑ Printed Circuit Board, stylus-force control
♠ 1-588-903-00	Ⓑ Printed Circuit Board, stylus-force indication
♠ 1-588-905-00	Ⓑ Printed Circuit Board, DME
♠ 1-588-906-00	Ⓓ Printed Circuit Board, power supply
♠ 1-588-907-00	Ⓔ Printed Circuit Board, stylus force
♠ 1-588-908-00	Ⓚ Printed Circuit Board, system-control
♠ 1-588-909-00	Ⓓ Printed Circuit Board, linear-motor
♠ 1-601-418-00	Ⓐ Printed Circuit Board, lead-in control

ACCESSORIES AND PACKING MATERIALS

Part No.		*Description*
3-701-613-00	Ⓐ	Bag, plastic
3-701-614-00	Ⓐ	Bag, plastic
3-701-616-00	Ⓐ	Bag, plastic
3-701-630-00	Ⓐ	Bag, plastic
3-701-634-00	Ⓐ	Bag, plastic
3-770-718-11	Ⓚ	Manual, instruction (AEP, UK model)
3-770-718-21		Manual, instruction (US model)
4-808-461-00	Ⓔ	Adaptor, 45 rpm
4-862-516-00	Ⓓ	Weight, sub
4-862-805-00	Ⓑ	Cushion, upper
4-862-806-00	Ⓑ	Cushion, lower
4-862-807-00	Ⓑ	Protector
4-862-808-00	Ⓒ	Bag, protection
4-862-809-00	Ⓑ	Protector (A)
4-862-810-00	Ⓑ	Protector (B)
4-862-811-00	Ⓐ	Sheet, protection
4-862-812-00	Ⓐ	Sheet (A), protection
4-862-817-00	Ⓐ	Sheet (B), protection

ELECTROLYTIC CAPACITORS

Note: Circled letter (Ⓐ to Ⓩ) are applicable to European models only.

	RATING				→ : Use the high voltage rated one.	
CAP. (μF)	6.3 VOLT.	10 VOLT.	16 VOLT.	25 VOLT.	35 VOLT.	50 VOLT.
	PART No.	PART No.	PART No.	PART No.	PART No.	PART No.
0.47					→	1-121-726-00 Ⓐ
1.0					→	1-121-391-00 Ⓐ
2.2					→	1-121-450-00 Ⓐ
3.3	→	→	→	1-121-392-00 Ⓐ	→	1-121-393-00 Ⓐ
4.7	→	→	→	1-121-395-00 Ⓐ	→	1-121-396-00 Ⓐ
10	→	→	1-121-651-00 Ⓐ	1-121-398-00 Ⓐ	→	1-121-738-00 Ⓐ
22	→	→	1-121-479-00 Ⓐ	1-121-480-00 Ⓐ	1-121-662-00 Ⓐ	1-121-152-00 Ⓐ
33	→	→	1-121-403-00 Ⓐ	1-121-404-00 Ⓐ	1-121-652-00 Ⓑ	1-121-405-00 Ⓐ
47	→	1-121-352-00 Ⓐ	1-121-409-00 Ⓐ	1-121-410-00 Ⓐ	1-121-653-00 Ⓑ	1-121-411-00 Ⓐ
100	→	1-121-414-00 Ⓐ	1-121-415-00 Ⓐ	1-121-416-00 Ⓐ	1-121-357-00 Ⓑ	1-121-417-00 Ⓑ
220	1-121-419-00 Ⓑ	1-121-420-00 Ⓑ	1-121-421-00 Ⓐ	1-121-422-00 Ⓑ	1-121-261-00 Ⓒ	1-121-423-00 Ⓑ
330	1-121-751-00 Ⓑ	1-121-805-00 Ⓑ	1-121-521-00 Ⓒ	1-121-654-00 Ⓑ	1-121-655-00 Ⓓ	1-121-656-00 Ⓒ
470	1-121-424-00 Ⓑ	1-121-425-00 Ⓒ	1-121-426-00 Ⓒ	1-121-733-00 Ⓑ	1-121-361-00 Ⓔ	1-121-810-00 Ⓓ
1000	–	1-121-736-00 Ⓒ	1-121-245-00 Ⓓ	1-121-657-00 Ⓓ	1-121-388-00 Ⓔ	1-123-061-00 Ⓕ
2200	1-121-658-00 Ⓑ	1-121-659-00 Ⓒ	1-121-660-00 Ⓓ	1-123-067-00 Ⓕ	1-121-984-00 Ⓕ	–
3300	1-121-661-00 Ⓓ	1-123-075-00 Ⓔ	1-123-071-00 Ⓕ	–	–	–

CAP. (μF)	100 VOLT.	160 VOLT.	250 VOLT.	350 VOLT.
	PART No.	PART No.	PART No.	PART No.
0.47	–	–	–	–
1.0	1-123-249-00 Ⓐ	1-123-252-00 Ⓐ	1-123-003-00 Ⓑ	1-121-168-00 Ⓑ
2.2	1-123-250-00 Ⓐ	1-123-026-00 Ⓑ	–	1-123-028-00 Ⓑ
3.3	1-121-995-00 Ⓐ	–	1-123-004-00 Ⓑ	1-123-006-00 Ⓒ
4.7	1-123-255-00 Ⓐ	1-121-246-00 Ⓑ	1-121-759-00 Ⓑ	1-123-007-00 Ⓓ
10	1-121-126-00 Ⓑ	1-121-999-00 Ⓑ	1-123-254-00 Ⓒ	1-123-008-00 Ⓓ
22	1-121-996-00 Ⓒ	1-123-253-00 Ⓒ	1-123-005-00 Ⓓ	1-123-022-00 Ⓓ
33	1-121-997-00 Ⓒ	1-121-757-00 Ⓒ	–	–
47	1-123-251-00 Ⓒ	1-121-919-00 Ⓒ	–	–
100	1-123-084-00 Ⓔ	–	–	–

CERAMIC CAPACITORS Ⓐ

			RATING				
CAP. (pF)	50 VOLT.	CAP. (pF)	50 VOLT.	CAP. (pF)	50 VOLT.	CAP. (μF)	50 VOLT.
	PART No.		PART No.		PART No.		PART No.
0.5	1-101-837-00	22	1-102-959-00	150	1-101-361-00	0.001	1-102-074-00
0.75	1-101-586-00	24	1-102-960-00	160	1-101-367-00	0.0012	1-102-118-00
1.0	1-102-934-00	27	1-102-961-00	180	1-102-976-00	0.0015	1-102-119-00
1.5	1-101-576-00	30	1-102-962-00	200	1-102-977-00	0.0018	1-102-120-00
2.0	1-102-935-00	33	1-102-963-00	220	1-102-978-00	0.0022	1-102-121-00
3	1-102-936-00	36	1-102-964-00	240	1-102-979-00	0.0027	1-102-122-00
4	1-102-937-00	39	1-102-965-00	270	1-102-980-00	0.0033	1-102-123-00
5	1-102-942-00	43	1-102-966-00	300	1-102-981-00	0.0039	1-102-124-00
6	1-102-943-00	47	1-101-880-00	330	1-102-820-00	0.0047	1-102-125-00
7	1-102-944-00	51	1-101-882-00	360	1-102-821-00	0.0056	1-102-126-00
8	1-102-945-00	56	1-101-884-00	390	1-102-822-00	0.0068	1-102-127-00
9	1-102-946-00	62	1-101-886-00	430	1-102-823-00	0.0082	1-102-128-00
10	1-102-947-00	68	1-101-888-00	470	1-102-824-00	0.01	1-102-129-00
11	1-102-948-00	75	1-101-890-00	510	1-101-059-00	0.022	1-101-005-00
12	1-102-949-00	82	1-102-971-00	560	1-102-115-00	0.047	1-101-006-00
13	1-102-950-00	91	1-102-972-00	680	1-102-116-00		
15	1-102-951-00	100	1-102-973-00	820	1-102-117-00		
16	1-102-952-00	110	1-102-815-00				
18	1-102-953-00	120	1-102-816-00				
20	1-102-958-00	130	1-101-081-00				

0.001μF = 1,000pF

CERAMIC (SEMICONDUCTOR) CAPACITORS Ⓐ

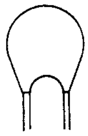
			RATING	→ : Use the high voltage rated one.	
CAP. (μF)	25 VOLT.	50 VOLT.	CAP. (μF)	25 VOLT.	50 VOLT.
	PART No.	PART No.		PART No.	PART No.
0.001	→	1-161-039-00	0.018	1-161-016-00	1-161-054-00
0.0012	→	1-161-040-00	0.022	1-161-017-00	1-161-055-00
0.0015		1-161-041-00	0.027	1-161-018-00	1-161-056-00
0.0018		1-161-042-00	0.033	1-161-019-00	1-161-057-00
0.0022		1-161-043-00	0.039	1-161-010-00	1-161-058-00
0.0027	→	1-161-044-00	0.047	1-161-021-00	1-161-059-00
0.0033	→	1-161-045-00	0.056	→	1-161-060-00
0.0039	→	1-161-046-00	0.068	→	1-161-061-00
0.0047	→	1-161-047-00	0.082	1-161-024-00	1-161-062-00
0.0056	→	1-161-048-00	0.1	1-161-025-00	1-161-063-00
0.0068	→	1-161-049-00			
0.0082	1-161-012-00	1-161-050-00			
0.01	1-161-013-00	1-161-051-00			
0.012	→	1-161-052-00			
0.015	1-161-015-00	1-161-053-00			

MYLAR CAPACITORS Ⓐ

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

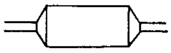
CAP. (μF)	RATING			CAP. (μF)				CAP. (μF)			
	50 VOLT.	100 VOLT.	200 VOLT.		50 VOLT.	100 VOLT.	200 VOLT.		50 VOLT.	100 VOLT.	200 VOLT.
	PART No.	PART No.	PART No.		PART No.	PART No.	PART No.		PART No.	PART No.	PART No.
0.001	1-108-227-00	1-108-365-00	1-108-409-00	0.01	1-108-239-00	1-108-377-00	1-108-421-00	0.1	1-108-251-00	1-108-389-00	1-108-433-00
0.0012	1-108-351-00	1-108-366-00	1-108-410-00	0.012	1-108-357-00	1-108-378-00	1-108-422-00	0.12	1-108-363-00	1-108-390-00	1-108-434-00
0.0015	1-108-228-00	1-108-367-00	1-108-411-00	0.015	1-108-240-00	1-108-379-00	1-108-423-00	0.15	1-108-252-00	1-108-391-00	1-108-435-00
0.0018	1-108-352-00	1-108-368-00	1-108-412-00	0.018	1-108-358-00	1-108-380-00	1-108-424-00	0.18	1-108-364-00	1-108-392-00	1-108-436-00
0.0022	1-108-230-00	1-108-369-00	1-108-413-00	0.022	1-108-242-00	1-108-381-00	1-108-425-00	0.22	1-108-254-00	1-108-393-00	1-108-437-00
0.0027	1-108-353-00	1-108-370-00	1-108-414-00	0.027	1-108-359-00	1-108-382-00	1-108-426-00	0.27	1-108-854-00	–	–
0.0033	1-108-232-00	1-108-371-00	1-108-415-00	0.033	1-108-244-00	1-108-383-00	1-108-427-00	0.33	1-108-855-00	–	–
0.0039	1-108-354-00	1-108-372-00	1-108-416-00	0.039	1-108-360-00	1-108-384-00	1-108-428-00	0.39	1-108-856-00	–	–
0.0047	1-108-234-00	1-108-373-00	1-108-417-00	0.047	1-108-246-00	1-108-385-00	1-108-429-00	0.47	1-108-857-00	–	–
0.0056	1-108-355-00	1-108-374-00	1-108-418-00	0.056	1-108-361-00	1-108-386-00	1-108-430-00				
0.0068	1-108-237-00	1-108-375-00	1-108-419-00	0.068	1-108-249-00	1-108-387-00	1-108-431-00				
0.0082	1-108-356-00	1-108-376-00	1-108-420-00	0.082	1-108-362-00	1-108-388-00	1-108-432-00				

TANTALUM CAPACITORS



CAP. (μF)	RATING				→ : Use the high voltage rated one.		
	3.15 VOLT.	6.3 VOLT.	10 VOLT.	16 VOLT.	20 VOLT.	25 VOLT.	35 VOLT.
	PART No.	PART No.	PART No.	PART No.	PART No.	PART No.	PART No.
0.01					→	→	1-131-396-00 Ⓑ
0.015						→	1-131-397-00 Ⓑ
0.022						→	1-131-398-00 Ⓑ
0.033						→	1-131-399-00 Ⓑ
0.047						→	1-131-400-00 Ⓑ
0.068					→	→	1-131-401-00 Ⓑ
0.1					→	→	1-131-402-00 Ⓑ
0.15					→	→	1-131-403-00 Ⓑ
0.22					→	→	1-131-404-00 Ⓑ
0.33					→	1-131-409-00 Ⓑ	1-131-405-00 Ⓑ
0.47	–	–	–	–	1-131-412-00 Ⓑ	→	1-131-406-00 Ⓑ
0.68	–	–	–	1-131-415-00 Ⓑ	→	1-131-410-00 Ⓑ	1-131-407-00 Ⓑ
1.0	–	–	1-131-418-00 Ⓑ	–	1-131-413-00 Ⓑ	→	1-131-408-00 Ⓑ
1.5	–	1-131-421-00 Ⓑ	–	1-131-416-00 Ⓑ	→	1-131-411-00 Ⓑ	1-131-348-00 Ⓑ
2.2	1-131-424-00 Ⓑ	–	1-131-419-00 Ⓑ	–	1-131-414-00 Ⓑ	1-131-355-00 Ⓑ	1-131-349-00 Ⓑ
3.3	–	1-131-422-00 Ⓑ	–	1-131-417-00 Ⓑ	1-131-362-00 Ⓑ	1-131-356-00 Ⓑ	1-131-350-00 Ⓑ
4.7	1-131-425-00 Ⓑ	–	1-131-420-00 Ⓑ	1-131-369-00 Ⓑ	1-131-363-00 Ⓑ	1-131-357-00 Ⓑ	1-131-351-00 Ⓒ
6.8	–	1-131-423-00 Ⓑ	1-131-376-00 Ⓑ	1-131-370-00 Ⓑ	1-131-364-00 Ⓑ	1-131-358-00 Ⓒ	1-131-352-00 Ⓒ
10	1-131-426-00 Ⓑ	1-131-383-00 Ⓑ	1-131-377-00 Ⓑ	1-131-371-00 Ⓑ	1-131-365-00 Ⓒ	1-131-359-00 Ⓒ	1-131-353-00 Ⓓ
15	1-131-390-00 Ⓑ	1-131-384-00 Ⓑ	1-131-378-00 Ⓑ	1-131-372-00 Ⓑ	1-131-366-00 Ⓒ	1-131-360-00 Ⓓ	–
22	1-131-391-00 Ⓑ	1-131-385-00 Ⓑ	1-131-379-00 Ⓒ	1-131-373-00 Ⓒ	1-131-367-00 Ⓓ		
33	1-131-392-00 Ⓑ	1-131-386-00 Ⓒ	1-131-380-00 Ⓒ	1-131-374-00 Ⓓ			
47	1-131-393-00 Ⓒ	1-131-387-00 Ⓒ	1-131-381-00 Ⓓ	–			
68	1-131-394-00 Ⓑ	1-131-388-00 Ⓒ	–	–			
100	1-131-395-00 Ⓓ	–	–	–			

TANTALUM CAPACITORS



CAP. (μF)	RATING					
	3 VOLT.	6.3 VOLT.	10 VOLT.	16 VOLT.	20 VOLT.	35 VOLT.
	PART No.	PART No.	PART No.	PART No.	PART No.	PART No.
0.033						1-131-273-00 Ⓔ
0.047						1-131-274-00 Ⓔ
0.068						1-131-275-00 Ⓔ
0.1						1-131-276-00 Ⓓ
0.15						1-131-277-00 Ⓓ
0.22			–	–	1-131-262-00 Ⓓ	1-131-278-00 Ⓓ
0.33			–	–	1-131-263-00 Ⓓ	1-131-279-00 Ⓓ
0.47			1-131-169-00 Ⓓ	–	1-131-264-00 Ⓓ	1-131-280-00 Ⓓ
0.68			–	1-131-258-00 Ⓓ	1-131-265-00 Ⓓ	1-131-281-00 Ⓓ
1.0			1-131-254-00 Ⓓ	–	1-131-266-00 Ⓓ	1-131-282-00 Ⓓ
1.5		1-131-250-00 Ⓓ	–	–	1-131-267-00 Ⓓ	1-131-283-00 Ⓔ
2.2		–	–	1-131-259-00 Ⓓ	1-131-268-00 Ⓓ	1-131-284-00 Ⓔ
3.3		–	1-131-255-00 Ⓓ	–	1-131-269-00 Ⓓ	–
4.7		1-131-251-00 Ⓔ	1-131-171-00 Ⓓ	–	1-131-270-00 Ⓓ	–
6.8		–	–	1-131-260-00 Ⓓ	1-131-271-00 Ⓔ	–
10	–	–	1-131-256-00 Ⓓ	–	1-131-272-00 Ⓔ	–
15	–	1-131-252-00 Ⓓ	–	1-131-261-00 Ⓔ		
22	–	–	1-131-257-00 Ⓔ	–		
33	1-131-176-00 Ⓓ	1-131-253-00 Ⓔ	1-131-173-00 Ⓒ	–		
47	1-131-288-00 Ⓕ	1-131-174-00 Ⓓ	–	–		
100	1-131-177-00 Ⓓ					

1/4 WATT CARBON RESISTORS Ⓐ

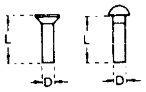
Note: Circled letter Ⓐ is applicable to European models only.

Ω	*Part No.*	Ω	*Part No.*	Ω	*Part No.*	Ω	*Part No.*	Ω	*Part No.*	Ω	*Part No.*	Ω	*Part No.*
1.0	1-246-401-00	10	1-246-425-00	100	1-246-449-00	1.0k	1-246-473-00	10k	1-246-497-00	100k	1-246-521-00	1.0M	1-246-545-00
1.1	1-246-402-00	11	1-246-426-00	110	1-246-450-00	1.1k	1-246-474-00	11k	1-246-498-00	110k	1-246-522-00	1.1M	1-210-814-00
1.2	1-246-403-00	12	1-246-427-00	120	1-246-451-00	1.2k	1-246-475-00	12k	1-246-499-00	120k	1-246-523-00	1.2M	1-210-815-00
1.3	1-246-404-00	13	1-246-428-00	130	1-246-452-00	1.3k	1-246-576-00	13k	1-246-500-00	130k	1-246-524-00	1.3M	1-210-816-00
1.5	1-246-405-00	15	1-246-429-00	150	1-246-453-00	1.5k	1-246-577-00	15k	1-246-501-00	150k	1-246-525-00	1.5M	1-210-817-00
1.6	1-246-406-00	16	1-246-430-00	160	1-246-454-00	1.6k	1-246-578-00	16k	1-246-502-00	160k	1-246-526-00	1.6M	1-210-818-00
1.8	1-246-407-00	18	1-246-431-00	180	1-246-455-00	1.8k	1-246-579-00	18k	1-246-503-00	180k	1-246-527-00	1.8M	1-210-819-00
2.0	1-246-408-00	20	1-246-432-00	200	1-246-456-00	2.0k	1-246-580-00	20k	1-246-504-00	200k	1-246-528-00	2.0M	1-210-820-00
2.2	1-246-409-00	22	1-246-433-00	220	1-246-457-00	2.2k	1-246-581-00	22k	1-246-505-00	220k	1-246-529-00	2.2M	1-210-821-00
2.4	1-246-410-00	24	1-246-434-00	240	1-246-458-00	2.4k	1-246-582-00	24k	1-246-506-00	240k	1-246-530-00	2.4M	1-244-754-00
2.7	1-246-411-00	27	1-246-435-00	270	1-246-459-00	2.7k	1-246-583-00	27k	1-246-507-00	270k	1-246-531-00	2.7M	1-244-755-00
3.0	1-246-412-00	30	1-246-436-00	300	1-246-460-00	3.0k	1-246-584-00	30k	1-246-508-00	300k	1-246-532-00	3.0M	1-244-756-00
3.3	1-246-413-00	33	1-246-437-00	330	1-246-461-00	3.3k	1-246-585-00	33k	1-246-509-00	330k	1-246-533-00	3.3M	1-244-757-00
3.6	1-246-414-00	36	1-246-438-00	360	1-246-462-00	3.6k	1-246-586-00	36k	1-246-510-00	360k	1-246-534-00	3.6M	1-244-758-00
3.9	1-246-415-00	39	1-246-439-00	390	1-246-463-00	3.9k	1-246-587-00	39k	1-246-511-00	390k	1-246-535-00	3.9M	1-244-759-00
4.3	1-246-416-00	43	1-246-440-00	430	1-246-464-00	4.3k	1-246-488-00	43k	1-246-512-00	430k	1-246-536-00	4.3M	1-244-760-00
4.7	1-246-417-00	47	1-246-441-00	470	1-246-465-00	4.7k	1-246-489-00	47k	1-246-513-00	470k	1-246-537-00	4.7M	1-244-761-00
5.1	1-246-418-00	51	1-246-442-00	510	1-246-466-00	5.1k	1-246-490-00	51k	1-246-514-00	510k	1-246-538-00	5.1M	1-244-762-00
5.6	1-246-419-00	56	1-246-443-00	560	1-246-467-00	5.6k	1-246-491-00	56k	1-246-515-00	560k	1-246-539-00		
6.2	1-246-420-00	62	1-246-444-00	620	1-246-468-00	6.2k	1-246-492-00	62k	1-246-516-00	620k	1-246-540-00		
6.8	1-246-421-00	68	1-246-445-00	680	1-246-469-00	6.8k	1-246-493-00	68k	1-246-517-00	680k	1-246-541-00		
7.5	1-246-422-00	75	1-246-446-00	750	1-246-470-00	7.5k	1-246-494-00	75k	1-246-518-00	750k	1-246-542-00		
8.2	1-246-423-00	82	1-246-447-00	820	1-246-471-00	8.2k	1-246-495-00	82k	1-246-519-00	820k	1-246-543-00		
9.1	1-246-424-00	91	1-246-448-00	910	1-246-472-00	9.1k	1-246-496-00	91k	1-246-520-00	910k	1-246-544-00		

HARDWARE NOMENCLATURE

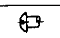
Screw: – P 3 x 10

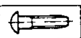
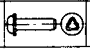
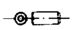
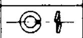
L: Length in mm
D: Diameter in mm
Type of head
Indicated slotted-head only.
Unless otherwise indicated, it means
cross-recessed head (Phillips type).



Nut, Washer, Retaining ring: N 3

Diameter of usable screw or shaft
Reference designation

Reference Designation	Shape	Description	Remarks
		SCREWS	
P		pan-head screw	binding-head (B) screw for replacement
PWH		pan-head screw with washer face	binding-head (B) screw and flat washer for replacement
PS PSP		pan-head screw with spring washer	binding-head (B) screw and spring washer for replacement
PSW PSPW		pan-head screw with spring and flat washers	binding-head (B) screw and spring and flat washers for replacement
R		round-head screw	binding-head (B) screw for replacement
K		flat-countersunk-head screw	
RK		oval-countersunk-head screw	
B		binding-head screw	
T		truss-head screw	binding-head (B) screw for replacement
F		flat-fillister-head screw	
RF		fillister-head screw	
BV		braizer-head screw	

Reference Designation	Shape	Description	Remarks
		SELF-TAPPING SCREWS	
TA		self-tapping screw	ex: TA, P 3 x 10
PTP		pan-head self-tapping screw	binding-head self-tapping (TA, B) screw for replacement
PTPWH		pan-head self-tapping screw with washer face	binding-head self tapping (TA, B) screw and flat washer for replacement
PTTWH		pan-head thread-rolling screw with washer face	binding-head (B) screw and flat washer for replacement
		SET SCREWS	
SC		set screw	
SC		hexagon-socket set screw	ex: SC 2.6 x 4, hexagon socket
		NUT	
N		nut	
		WASHERS	
W		flat washer	
SW		spring washer	
LW		internal-tooth lock washer	ex: LW3, internal
LW		external-tooth lock washer	ex: LW3, external
		RETAINING RINGS	
E		retaining ring	
G		grip-type retaining ring	

Sony Corporation

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